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# USSR Report

ECONOMIC AFFAIRS

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8 June 1984

# USSR REPORT

## ECONOMIC AFFAIRS

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## PLANNING AND PLANNING IMPROVEMENT

### CONTROL OVER PLANNING OPERATIONS DISCUSSED

Moscow PLANOVOYE KHOZYAYSTVO in Russian No 2, Feb 84 pp 86-93

[Article by D. Shmelev: "Control in the Work of Planning Agencies"]

[Text] The Communist Party has always devoted and continues to devote great attention to the control and verification of the fulfillment of state plans as highly important instruments in their realization. During the course of socialist construction as a result of changes in the forms and methods of economic planning and management the methods and forms of controlling the fulfillment of plans have also changed, and accounting and statistical reporting have been improved.

Already during the pre-war period planning, economic, and statistical agencies had accumulated work experience in controlling plan fulfillment. In Gosplan USSR the verification of plan fulfillment became one of its most important functions beginning with the 1st Five-Year Plan. This work was carried on most intensively during the 2nd and 3rd Five-Year Plans. In the Statute of Gosplan USSR which was adopted on 2 February 1938 the Council of People's Commissars expanded its duties with respect to performing a systematic verification of the fulfillment of the economic plan, especially with respect to controlling proportionality in the development of the economy.

At practically every meeting of Gosplan USSR there were hearings of reports by responsible workers on the fulfillment of plans and on the development of branches; representatives of the people's commissariats and of the departments took extensive part in the series. Every quarter a list of issues was planned which was subject to examination (fuel, chemicals, machine building, and so forth).

A positive role in strengthening planning discipline and in overcoming localism and departmentalism was played by the creation in 1938 of the Institute of Gosplan USSR Commissioners in the union and autonomous republics and in the krais and oblasts; these commissioners gave considerable attention to verifying the fulfillment of plans.

Work on controlling and verifying plan fulfillment became especially important during the period of the Great Patriotic War. Wide use was made of the experience which was gained during the postwar period also. In 1948, in



order to strengthen control over the fulfillment of the 4th Five-Year Plan, a special commission was created in Gosplan USSR which systematically examined the results of the fulfillment of plans over the period of a month, quarter, and year. As a rule, the commission's conclusions and suggestions were a subject of discussion at meetings of Gosplan USSR.

A large amount of attention was devoted to strengthening plan control and verification and toward improving the methods of directing the economy at the 24th, 25th, and 26th Party Congresses. At the 26th CPSU Congress it was emphasized: "The party has always looked upon the plan as law. And not only because it is approved by the Supreme Soviet. The plan is law because only its observance ensures the ordered operation of the economy."\* The composition of the plan is only the first step in planning. The most difficult and lengthy work is the work connected with the practical fulfillment of the plan which is attained only on condition that constant and systematic control is carried out.

The tasks of verifying and controlling plan fulfillment have become especially important now when a unified economic complex which embraces all of the elements of public production, distribution, and exchange has been formed. For this reason any disturbance of this unity if only in one of its elements can have a negative effect upon the entire chain of economic connections.

The vital necessity for strengthening the work connected with controlling and verifying plan fulfillment follows from the decisions of the November (1982) and the June and December (1983) Plenums of the CPSU Central Committee at which the issues of increasing discipline and overcoming lagging at a number of highly important sectors of economic operations due to the underfulfillment of assignments were sharply posed. In the address of the General Secretary of the CPSU Central Committee Yu. V. Andropov at the December (1983) Plenum of the CPSU Central Committee it was emphasized that the strict fulfillment of the state plan is becoming not only an obligation, but also the patriotic duty of every Soviet person, every labor collective, and every party and public organization.

The measures adopted by the party to strengthen state, labor, and planning discipline at enterprises and construction sites had a positive effect upon improving all economic operations in 1983. Thus, national income increased compared to 1982 by 3.1 percent, while the volume of industrial production and agricultural output increased by 4 and 5 percent. A number of measures aimed at the introduction into production of the achievements of science and technology have been carried out. In production 3,700 items of new machinery, equipment, instruments, and materials have been mastered, and a number of new production processes introduced. A further increase in the well-being of the people has been ensured. The average monthly wages of workers and employees increased by 2.4 percent, and the payment of the labor of kolkhozniks by 7 percent. Last year more than 120 million square meters of housing space were

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\*"Materials of the 26th CPSU Congress," Moscow, Politizdat, 1981, p 50.

constructed which made it possible to improve the living conditions of more than 10 million people. Retail commodity turnover increased by 2.7 percent. Large steps were taken in the realization of the Food Program and this had a positive effect on supplying the population with foods. Compared to 1982, procurements of grain, sugar beet, cattle, and poultry, milk, and other foods increased.

The positive tendencies which have occurred in the development of the economy have to be maintained and developed in 1984 in view of the fact that in the new year it will be necessary to achieve higher economic development rates than in the first two years of the 5-year plan. Compared to 1983, the increase in national income has been planned in the amount of 3.1 percent, industrial production--3.8 percent, and agricultural production--almost 5 percent.

In the plan for 1984 great emphasis is being put on increasing the efficiency of public production. It is planned to obtain 97 percent of the increase in national income and 90 percent of the increase in industrial output and construction and installation work on the basis of an increase in labor productivity. In agriculture and railroad transportation the entire increase will be obtained on the basis of an increase in labor productivity. There must also be a substantial increase in the use level of production capacities for the production of a number of types of output.

In the system of agencies of state management an important role is assigned to Gosplan USSR, to the gosplans of the union and autonomous republics, and to local planning agencies which have been given the responsibility not only of preparing draft plans of economic and social development, but also of controlling the fulfillment of these plans.

In view of the fact that at every level of planning concrete tasks are accomplished, the organization of control over plan fulfillment has to correspond to the tasks which are accomplished by the given planning agency. If we look in this connection at the work of Gosplan USSR and its divisions, their work on controlling plan fulfillment has to be concentrated on a deep analysis of the rates and proportions of economic development as a whole, on the effectiveness of the use of fixed productive capital and of capital investments and natural, labor, and material and financial resources, on disclosing discrepancies and disproportions in the development of the economy and of its individual branches, and on the fulfillment of assignments to increase the efficiency and intensification of production.

The development and reflection in the state plans of measures which ensure the proportional and dynamic development of the economy and the maximum use of existing reserves and of scientific and technical achievements will be the result of the performance of this kind of analysis. This is the essence of the influence of control not only on the fulfillment but also on the process of the development of plans.

Under present-day conditions the responsibility of the divisions of Gosplan USSR for the fulfillment of plans is becoming much greater. They have to take a decisive stand against departmentalism and narrowly local attitudes. When the fulfillment of established assignments is analyzed miscalculations and discrepancies which were made during the period of the working out of the plans and which have to be corrected may be discovered.

In recent times more active and purposeful work on the verification of plan fulfillment has been conducted in Gosplan USSR and its divisions. As a rule, the fulfillment of the plan for a quarter and for a year is systematically examined at the board of Gosplan USSR and its divisions. In November 1983 the board of Gosplan USSR approved a schedule for reports by a number of ministries on the fulfillment of their plans. The preparation of materials for the meetings of the board has been made the responsibility of the Gosplan USSR divisions and of specialists who are enlisted from the ministries.

The performance of the work on the verification and analysis of plan fulfillment was helped by the fact that the plan indicators, beginning with the association and enterprise and right up to the summary plan of the economic and social development of the country, are calculated according to a uniform methodology which ensures their comparability. All of this is reflected in the statistical reporting.

One of the important indicators in the system of measures to strengthen planning discipline is the plan for output production and for the delivery of output in accordance with contracts and orders; it should be considered here that with the present-day dimensions of social production and of its extensive specialization and cooperation the planned and stable functioning of the economy depends to a large extent upon the strict fulfillment by associations and enterprises of their output delivery commitments.

At the present time the country has almost 28,000 associations and enterprises, or 77 percent of their total number, whose work is evaluated depending upon their fulfillment of their contract commitments. Moreover, these enterprises' share of the total output sales in the country as a whole comes to around 90 percent. Many enterprises and associations successfully deal with output deliveries in accordance with contracts and orders. In the decree of the CPSU Central Committee and USSR Council of Ministers which was adopted on this matter in 1983 the Magnitogorsk Metallurgical Combine, the Railroad Coach Building Plant imeni Yegorov, and others are cited as examples of this.

At the same time, there are serious deviations in the realization of output deliveries. There are still a substantial number of associations and enterprises which do not fully fulfill their contract commitments to consumers, and this leads to disturbing the balance of plans, to the incomplete utilization of production capacities, and frequently to idle time, and to holding back the growth of labor productivity and a decrease in production efficiency. Thus, the workers of the Ministry of Light Industry of the Ukraine explain the underfulfillment of the plan for the production of knitted under-



wear in the first quarter of 1983 by wool and cotton yarn delivery shortfalls from the enterprises of the textile industry of the Uzbek SSR and the Kirghiz SSR, and of chemical fibers and threads from the enterprises of the chemical industry.

The unsatisfactory fulfillment of its delivery plan for steel pipes by the Nikopol' Southern Piping Plant had a negative effect upon providing comprehensive equipment for a number of start-up projects and on the fulfillment of their production plans at the enterprises of the Ministry of Chemical Machine Building.

The workers of the cellulose and paper industry systematically fail to meet their commitments to consumers. With an overall fulfillment of its plan in cost terms, in 1983 the USSR Ministry of Timber and Paper Industry substantially failed to meet its contracts and orders for commercial timber, sawn materials, plywood, and a great deal of other output, and this led to stoppages in work at a number of branches of industry and also in capital construction.

The fulfillment of contract deliveries has to be one of the chief indicators of the work of branch ministries and of production collectives and their leaders.

The growth of labor productivity as a most important condition for the successful fulfillment of plans, for increasing the efficiency of the economy, and for increasing the labor and political activeness of workers has to be at the center of attention of plan fulfillment control. At the present time this factor is the basis for the increase in three-fourths of national income and for more four-fifths of the increase in industrial output and in shipments. However, in industry, agriculture, and in transportation and construction there are still large losses of working time, labor resources are not utilized efficiently everywhere, and labor turnover is being reduced slowly. For this reason, it is not accidental that the issue of strengthening the socialist discipline of labor has taken on paramount importance.

The realization of a number of measures in accordance with the decisions of directive agencies made it possible in 1983 to substantially increase labor productivity in all of the branches of the economy. For example, with an annual assignment of 2.9 percent the actual labor productivity growth rate in industry came to 3.4 percent. In addition, the increase in industrial output on the basis of an increase in labor productivity came to 88 percent and of railroad hauls to 98 percent. In a number of union republics--the Ukrainian and Estonian ones--and in the cities of Moscow and Leningrad practically the entire increase in industrial output was obtained on the basis of a rise in labor productivity. However, as was observed at the June (1983) Plenum of the CPSU Central Committee it is necessary to strive to attain the highest world level here and to make fuller use of large reserves. These reserves exist above all in increasing the level of the mechanization and automation of production and in improving the organization of labor and strengthening labor discipline.

A large amount of work in this direction is being carried out by the collective of the Kuybyshev Metallurgical Plant imeni V. I. Lenin where mechanization and automation are effected with the help of machinery along the entire technological chain up to the production of final output. At the same time, at a number of enterprises of the coal, timber, food, and meat and dairy industries, where manual labor is still being used, sufficient measures are not being taken for production mechanization. A substantial number of enterprises and construction projects which are under the management of the USSR Ministry of Coal Industry, the USSR Ministry of Timber and Paper Industry, the USSR Ministry of Construction Materials, the USSR Ministry of Food Industry, and the USSR Ministry of Light Industry do not fulfill their assignments for an increase in labor productivity.

A thorough curtailment of losses of working time and of the turnover of worker cadres is an important reserve for increasing labor productivity. According to the data of statistical surveys, in a number of branches of the economy there are large full-day and intra-shift stoppages. Their level is being reduced slowly at the enterprises of the Ministry of Electrical Engineering Industry, the Ministry of Instrument Making, and the Ministry of Light Industry and in a number of construction industries. For example, in the "Tsemstroy" Trust of the USSR Ministry of Construction in Mordoviya losses of working time in individual periods in 1983 reached 12.5 percent of the time worked. At certain enterprises and associations of the food, and the meat and dairy industry and the construction materials industry the turnover of labor cadres was large.

An increase in the growth rates of labor productivity is achieved by the extensive use in production of scientific and technical achievements and of advanced experience. Meanwhile, the plan assignments in this field are not being fully fulfilled. Last year there was a substantial underfulfillment of the assignments for the introduction of progressive technology, the automation of production processes, and the introduction and construction of progressive technology.

There are great opportunities for a further increase in labor productivity in the wider use of advanced forms of labor--brigade contracting and the Shchekino method. Enterprises which employ the Shchekino method for the organization of labor obtain more than 90 percent of their increase in output through it.

Workers collectives of Moscow and Leningrad and of the Ukraine and Kazakhstan, fulfilling their patriotic duty, have become the initiators of a movement for an above-plan increase in labor productivity. This initiative received complete approval at the December (1983) Plenum of the CPSU Central Committee. Party and trade union organizations and labor collectives have been given the task of achieving an above-plan increase in labor productivity of no less than one percent.

Controlling the efficient use of raw materials, electric energy, materials, fixed capital, fuel and raw materials, and agricultural output has to be in the field of vision of economic leaders.

However, there are cases of the inefficient consumption of resources. For example, every 11 out of 12 checked enterprises of the Ministry of Heavy Machine Building without authorization decreased their 1983 assignments for an average reduction of the expenditure norms for rolled ferrous metals which were established for them by the ministry. The same situation occurred in certain enterprises of the Ministry of Agricultural Machine Building.

Planning agencies and the agencies of Gosstab USSR have to maintain constant control over the economic and efficient use of material resources, and of the validity of the determination by clients of their need for fuel, raw materials, and materials, and also of their requisitions for the production and delivery of output.

An analysis of the cost of output has the goal of establishing the price in material and labor expenditures that output costs the state. At the December (1983) Plenum of the CPSU Central Committee the task was set of lowering the cost of output in addition to the planned reduction for 1984. The accomplishment of this task requires a more skillful and efficient use of labor resources, fixed capital, and fuel and raw materials which occupy a large proportion in the production of output. In our economy every day 1.5 billion rubles of material resources are expended. For this reason, a decrease in expenditures of even one percent produces a considerable addition to the increase in national income. Strict economizing in the expenditure of all materials and fuel and energy resources is one of the ways of increasing the efficiency of our economy.

In order to ensure a decrease in material expenditures per ruble of industrial commodity output beginning with 1983 a ceiling on material expenditures has been established for ministries and departments in the plan.

The introduction of this indicator into the plan has been having a positive effect on the education of enterprise leaders in raising the level of economic operations. According to the data of Gosplan of the Latvian SSR, in 1983 in the republic's industry there was a substantial lowering of the level of material expenditures per ruble of commodity output compared to 1982.

However, not all of the ministries and departments and their subordinate enterprises and associations have been keeping within the ceiling on material expenditures which has been established for them. The ceiling has been exceeded in the branches of ferrous metallurgy, the petrochemical and meat and dairy industries, heavy and energy machine building, and by the construction ministries.

The CPSU Central Committee and the government of the USSR attribute especial importance to capital construction on the basis of the fact that economic growth rates and the observance of proportionality depend to a large extent



upon the renewal and use of productive capital. It is sufficient to say that in our country every year there are commissioned around 200 large industrial enterprises, a substantial number of construction projects in agriculture and transportation, and residential houses and other objects of social and cultural purpose.

However, an analysis has discovered definite shortcomings in the planning and realization of construction plans which are the result of the poor organization of construction work and the incomplete coordination of capital investments with financial and material and technical resources and the capacities of construction organizations. Checks which have been conducted in recent years have shown the following: as a rule, a large part of the fixed capital and production capacities which are put into operation are done so during the fourth quarter, and this in its practical effects leads to shock work and a worsening of the quality of construction. Such instances are impermissible.

Certain construction and installation organizations systematically fail to fulfill their planning assignments for the construction and commissioning of fixed capital and production capacities. Objects are frequently put into operation with large amounts of unfinished work. In a number of cases, despite the fact that delivery dates have been agreed upon with clients and contracting construction organizations, some objects which are supposed to be commissioned are postponed to the following year. Moreover, enterprises and capacities whose commissioning dates have already been postponed several times do not go into operation.

Contracting ministries do not take the necessary measures for the concentration of material and technical resources and labor power in order to accelerate the commissioning of objects whose delivery dates have repeatedly failed to be met.

An increase in the efficiency of the use of fixed capital, production capacities, and also of capital investments is of great importance in the planning of social production.

Toward this end, in a decree of the December (1983) Plenum of the CPSU Central Committee it was found useful for Gosplan USSR and the ministries and departments and Councils of Ministers of the union republics to develop special measures to eliminate inter-branch and intra-branch disproportions and bottlenecks and to clearly define the ways and means of carrying them out.

At the beginning of 1982 the value of industrial fixed productive capital came to a very impressive amount--592 billion rubles, or 32 percent of the value of total fixed capital.

Yet, return on capital in industry has shown a tendency in recent years toward a certain decline, which is explained not only by an increase in specific capital investments for construction in new areas and the increased

cost of equipment, but also by the prolonging of the mastering periods for planned capacities.

In the petrochemical industry there has been a substantial underutilization of capacities for the production of chemical products on account of failures to deliver crude petroleum and of the unsatisfactory mastery of planned capacities. Large difficulties in this connection are being experienced by the petroleum refining enterprises of Bashkiriya, Omsk, Angarsk, Yaroslavl', Gorki, and Kuybyshev.

In ferrous metallurgy the incomplete utilization of production capacities is the result of a worsening of the work of the iron ore and coke and chemical industries, above-plan equipment idle time, and other reasons. For example, in 1983 capacities for the production of finished rolled goods were substantially underutilized at the Dreprovsk imeni Dzerzhinskiy, the Makeyevka, and the Yenakiyevo Metallurgical Plants. As a result of the incomplete utilization of the capacities of the Khartsysk and Volga Piping Plants and the Chelyabinsk Rolled Piping Plant these enterprises failed to give the country a large quantity of steel piping.

In the chemical industry a low level of the utilization of production capacities is most characteristic for enterprises which produce piping made of thermoplasts, polymer film, polyethylene, products made of plastic, mineral fertilizers, polystirol, ethylene, and other types of output. Similar facts have also been discovered in other branches.

The effectiveness of control and verification depends upon the level of the organization of work in planning and economic agencies. The verification of the punctual delivery of the assignments of the state plan to perform this is an important step in the planned management of the economy. The punctual delivery of indicators makes it possible to begin the development of detailed production, industrial, and financial plans in associations, at enterprises, and at construction projects, seeking during the course of this development additional possibilities for the overfulfillment of established assignments. The planning and economic administrations of ministries and departments and also the Gosplans of the union republics have a large responsibility in carrying out this work. Planning agencies have to give especial attention to: the necessity for the correct distribution of planning assignments for production and for an increase in labor productivity by quarters; the ensuring of the absolute fulfillment of assignments for economizing material and technical resources; an increase in production and an expansion of the assortment of consumer goods; the coordination of the individual assignments of the plan, and so forth.

When the punctuality of bringing plans to performers is checked one has frequent occasion to encounter instances of a violation of established schedules, which leads to difficulties in work. This applies especially to plans for material and technical supply, title lists for capital construction, labor, costs, profits, and a decrease in the expenditure norms for material and technical resources.

Since 1984, in addition to assignments for an increase in labor productivity, the plan has had established in it the normative correlation between an increase in labor productivity and an increase in average wages, including bonuses and other types of compensation from the material incentives fund, in order to increase the responsibility of ministries and of the leaders of economic organizations for ensuring an outstripping growth rate for labor productivity compared to wages.

Continuity and systematicalness are an important principle of the organization of control over plan performance. Any kind of deviation from this rule can lead to undesirable consequences. In essence, this is exactly what happened in the coal industry which until 1979 had successfully dealt with the fulfillment of its basic plan. This engendered elements of complacency among certain of the branch's workers. The ministry's leadership and apparatus did not take the necessary measures in time to improve mining work in the mines and make fuller use of their planned indicators, and to eliminate lagging in the preparation of new levels and work fronts. Only after the intervention of the appropriate agencies and as a result of additional measures was it possible to improve the situation in the branch.

In certain branches it is more useful to verify plan fulfillment in coordination with an analysis of plan fulfillment in related productions. And in this respect the organizing role of Gosplan USSR, particularly of its divisions, becomes especially important. The performance of comprehensive verifications has to be carried out with the unfailing active participation of workers from Gossnab USSR, the Central Statistical Administration USSR, the appropriate ministries and departments, Gosstroy USSR, the State Committee for Science and Engineering, the USSR State Committee for Labor, the Gosplans of the union republics, and also of the kray and oblast planning commissions. In this connection, there must be a substantial increase in the role of the division of territorial planning and the siting of the productive forces of Gosplan USSR which, jointly with the affected divisions of Gosplan USSR and the Gosplans of the union republics, has the duty of organizing comprehensive verifications of plan fulfillment by the union republics, the krays, and the oblasts. It is also essential to enlist in this work the authorized agents of Gosplan USSR for the individual economic regions, keeping it in mind that it is their obligation to exercise systematic control over the fulfillment of the decisions of the party and government and of the most important planning assignments for the economic and social development of their regions, and also of the territorial production complexes which are located in them.

Comprehensive verifications make it possible to discover discrepancies in the planning of individual assignments and to make the necessary corrections in the corresponding plan indicators in good time. The lack of an objective evaluation of the degree of plan fulfillment by inter-coordinated branches can lead to incorrect conclusions and to the creation of shortages of certain types of output. For example, the underfulfillment of the plan for the production of individual types of rolled goods has been caused to a definite degree by lagging in the development of the raw materials ore base and of coke and chemicals and by certain other reasons. The same applies to ensur-

ing the fulfillment of the assignments to increase the production of mineral fertilizers whose production is being held back, among other reasons, by a lagging in the production of sulphuric acid.

The performance of comprehensive checks in the basic and related productions makes it possible to discover the reasons for inter-branch and intra-branch disproportions more rapidly and more accurately.

The system and methods of reporting, information, and evaluations should correspond to the tasks of planning on all levels, be all-embracing and, at the same time, sufficiently detailed and comparable, and ensure the summarizing of results for planning indicators within the limits of a specific period.

The economic services of ministries and enterprises and the workers of planning agencies have to give greater attention to ensuring an accurate and objective evaluation both of the expected plan fulfillment (the evaluation becomes possible during the development of the draft plan) and a current evaluation which becomes established during the course of plan fulfillment. The most widespread error is the overstating of expected fulfillment especially for the commissioning of production capacities and for production volumes of metal, timber and construction materials, and many types of light and food industry output. This leads to a subsequent correction of certain assignments during the very first months of the new planning period.

In revealing shortcomings in the realization of plans planning and economic agencies do not always work out measures to eliminate them with sufficient depth and concreteness, and frequently limit themselves solely to an analysis of the fulfillment only of the quantitative indicators of the plan. Frequently the necessary sense of principle and persistence in the practical realization of planned measures is lacking.

In the USSR Ministry of Coal Industry, USSR Ministry of Ferrous Metallurgy, the Ministry of Chemical Industry, and the USSR Ministry of Light Industry instances of a violation of the established correlation between an increase in labor productivity and of average wages are frequently discovered. However, the necessary measures to bring order in this matter are not taken.

In industry there are still a number of enterprises and construction projects which do not cope with the fulfillment of their plans and thereby create difficulties for enterprises in related branches. For example, on account of failures for enough ethylene to be supplied from the Lisichansk Petroleum Refining Plant the Northern Donetsk "Azot" Association imeni the Leninist Komsomol did not fulfill its polyethylene production plan. The USSR Ministry of Chemical Industry did not take effective measures to overcome the lagging in the work of this enterprise.

Control over the fulfillment of plans is based on the system of economic information at all levels—from the association and enterprise to the economy as a whole. The basis of reporting information is made up of the work



indicators of production associations and enterprises and of ministries and departments of union and union-republic subordination and also of union republics. Statistical reporting is worked up by the agencies of state statistics. At the present time the ministries and departments receive all of their basic statistical data through the agencies of the Central Statistical Administration, while the statistical agencies receive reporting on plan fulfillment from every production association and enterprise in accordance with the established forms and on an established date.

The process of planning leadership cannot be reduced to the simple establishment of the fact of the fulfillment or non-fulfillment of a plan. It must without fail include an objective evaluation of the state of the fulfillment of the plan's assignments, the development of measures which ensure their realization, and the practical implementation of these measures. An objective evaluation is an inseparable part of the verification of plan fulfillment. The comparison of reporting and planning indicators makes it possible to evaluate the fulfillment of the plan for all of its indicators both in a branch and in a territorial breakdown.

It is a most important task of planning and economic agencies to ensure systematic and effective control of the fulfillment of plans, a detailed analysis of the processes occurring in the economy, and increased responsibility by enterprise and construction project leaders for the strict fulfillment of plans. This will promote the solution of the problems connected with balancing plans, the stability of the latter, and the eradication of instances of an understatement of planning indicators.

The correcting of plans in the direction of decreasing their indicators, especially for the first quarters of the year, to which certain economic leaders sometimes still resort leads to the weakening of planning discipline--to attempts to embellish the situation in branches and at enterprises--and reduces the enthusiasm of cadres and lowers their responsibility for their work, which, on the whole, inflicts damage upon the country's economy.

The Central Committee of the party and the USSR Council of Ministers have adopted a number of important decisions aimed at raising the level of planning and economic management and at strengthening planning, labor, and production discipline. They contain measures to expand the rights of associations and enterprises and to increase their responsibility for their work results, to improve the work of transportation, to accelerate scientific and technological progress, to improve the economic relationships between agriculture and other branches, to strengthen economic discipline, to economize the expenditure of material resources, and other matters.

As Yu. V. Andropov emphasized in his speech at the December (1983) Plenum of the CPSU Central Committee, "People have begun to work with a better mood. The rates of economic growth have increased, and qualitative indicators have improved somewhat. On the whole, there has been a positive change in the economy. All of this confirms the directness of the line which has been

worked out by the party and the reality and validity of the tasks it has set for the development of the economy and for overcoming existing difficulties.

As we see, there are results. But this is only the beginning. The most important thing now is not to lose the pace which has been achieved and the generally positive attitude toward work and to actively develop positive processes."\*

In this connection the role and importance of planning agencies is increasing in improving control over the implementation of party and government decisions to further develop the country's economy.

An improvement of the level and quality of work in controlling the fulfillment of state plans for economic and social development in all of the elements of the system of planning agencies will promote the successful accomplishment of the tremendous tasks of communist construction.

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\*PRAVDA, 27 December 1983.

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## INDUSTRIAL DEVELOPMENT AND PERFORMANCE

### REASONS FOR CAPITAL STOCK UNDERUTILIZATION SOUGHT

Moscow PLANOVOYE KHOZYAYSTVO in Russian No 2, Feb 84 pp 34-38

[Article by V. Abramov, candidate of economic sciences: "Ways to Improve Utilization of Fixed Capital"]

[Text] One of the most important tasks in industry is to insure complete utilization of fixed capital and production capacities of enterprises. Converting the economy to a primarily intensive path of development presupposes, in addition to a rapid rate of growth of fixed capital, an all-out increase in its return and rational loading of existing equipment. Therefore, it is extremely important for the national economy to achieve an increase in its shift factor, especially for metalworking equipment, and a reduction in downtime.

Some economists consider shortage of workers the main cause of the inadequate utilization of equipment. Others are of the opinion that reserves of the production apparatus have been exhausted for the most part, and propose accelerating the creation of additional capacities and increasing the means for enterprise reconstruction. A number of economic managers support this position also.

To a certain degree such views are due to deficiencies in the analysis of equipment loading and capacities. Questions pertaining to the role of production capacity in analyzing and planning utilization of fixed capital have not been fully worked out in theory. But in practice, reserves for improving the utilization of labor resources are identified with weak involvement of capacity indicators. In particular, this is attested to by the fact that equipment work is evaluated chiefly on the basis of one-time observations without taking into account its loading coefficient.

On the basis of the data of a one-time survey being conducted by the USSR Central Statistical Administration, the conclusions are being drawn that the main causes of downtime of machine tools and machines are shortage of workers, lack of raw and processed materials, semi-finished articles, parts, assemblies, and tools, malfunction and non-planned repair, and others. Nonetheless, analysis of the utilization of equipment at certain Rostov Oblast enterprises which we conducted, using its loading coefficient determined in calculating the production capacity of the enterprises, demonstrates that the basic cause of downtime of some equipment is the lack of a plan assignment, that is, an

imbalance between the plan and existing capabilities. At the same time, according to the data of the one-time survey, the duration of downtime for this reason is very slight.

The extent of downtime of machine tools and machines determined by using its loading coefficient differs very little from the total duration of the downtime, established during the one-time survey, although the characteristics of the causes are substantially different. For example, at the enterprises under analysis, downtimes resulting from a lack of a plan assignment and determined using its loading coefficient, reached 21-36 percent of the planned time fund, but according to the data obtained on the basis of the one-time survey, they did not exceed 6 percent; while at the Taganrog Combine Plant and in the Pressmash Production Association, not one hour of downtime of machine tools and machines was recorded for this reason.

At some machine-building enterprises, there is a disproportion of capacities between internal subdivisions and groups of equipment, which leads to incomplete loading of many machine tools and machines. The establishment in the Ministry of Tractor and Agricultural Machine Building of the loading coefficient of equipment for the 10th Five-Year Plan at 0.80 also attests to the presence of downtime of machine tools and machines resulting from the lack of a plan assignment. The ministry as a whole and most enterprises did not achieve this norm. However, according to the data of a one-time survey of equipment use conducted in 1980, the rate of downtime of machine tools and machines due to the lack of a plan assignment in the planned time fund for nine tractor and agricultural machine building enterprises in Rostov Oblast as well as for the oblast's machine building industry on the whole was two percent.

Upon examining the methods of making the one-time survey of equipment use, a number of factors are identified which put the accuracy of results obtained in doubt. Many downtimes revealed during the survey caused by such things as lack of materials, semifinished articles, parts, assemblies, and tools, shortage of workers, and so forth are not confirmed in records, other than the observation sheet. As a result, it becomes much more difficult to verify them.

Unlike one-time survey data, materials on equipment use obtained using the loading coefficient are more reliable. This coefficient is established on the basis of objective data (the number of labor implements, the actual time fund of machine tool work, and labor intensity of output produced) and is one of the elements for calculating production capacity. Calculations are recorded and their accuracy may be verified.

Such an analysis does not establish a basis for denying the existence of downtime of machine tools and machines due to a shortage of workers, the lack of materials, semifinished articles, parts, assemblies, tools, and attachments, malfunction, unplanned repair, and other causes related to shortcomings in the organization of production and labor. But it attests to the fact that non-loading of equipment due to the lack of a plan assignment is a predominant part of all downtimes.

From what has been said, the conclusion is drawn that one-time survey data on equipment use does not fully identify the actual causes of its downtimes and their extents. As a result, scientists and production workers are devoting their attention chiefly to downtime related to shortcomings in the organization of labor, and to a much lesser extent, to reserves for increasing the yield of fixed capital funds, concealed in calculations of production capacity and planning of the use of labor means.

The significance of production capacity in substantiating intensive enterprise plans on output volume and utilization of fixed productive capital is very great. However, it is still not sufficiently taken into consideration for this purpose. In order to increase the role of the capacity indicator in planning both production volume by inventory and utilization of funds, its calculation period must be changed from the start of the plan year to the period when the annual plan (technical industrial financial plan) of the industry is being worked out and calculation methods must be in accordance with the capacity determined. Existing methods for establishing capacity according to the leading link are at variance with this determination, since it results in calculation on the minimum level identified among the leading shops of the enterprise, sections, and groups and units of equipment. Calculating according to the leading link leads to using up the full loading of equipment and the optimal level of output production. Work is being done at machine building enterprises to eliminate bottlenecks, the share of which in the disproportion of capacities is insignificant. However, superfluous capacities, which make up the predominant part of the disproportion, are being poorly loaded. As a result, an insufficient level of equipment use lasts for a long time.

The normative method of calculating capacity is most appropriate for determining production capacity. It is expressed in establishing equipment work time norms on the basis of a technically substantiated level of labor productivity, which results in full utilization of worker time and makes it possible to maximally load machine tools and machines of enterprises.

Analysis shows that improving the determination of the labor intensity of output being manufactured is also necessary for a normative calculation of capacity. At the present time fundamental shortcomings in scientific and technical substantiation of labor norms are being permitted. Significant overfulfillment of output norms at many enterprises is proof of the low level of these norms. In 1980 throughout the industry on the whole they were overfulfilled by 121.2 percent and in 1981, by 122.6 percent. In Rostov Oblast, according to data for October, 1982, production was 122.1 percent, including 124.7 percent in the machine building and metal processing industries, while at some enterprises and in some shops, it totaled 130-160 percent.

Most time norms (output norms) of basic production according to reports of enterprises are reckoned both sectorially and intersectorially, that is, they are technically substantiated, and consequently, progressive. However, significant overfulfillment of them contradicts this. Many labor norms are included among the technically substantiated norms in name only.

In order to accurately calculate production capacity, it is important to use a progressive level of output norm fulfillment. But this is not always taken into account at enterprises. At the present time objective and subjective factors have developed which make such use difficult. With individual organization and payment of labor, the fulfillment of output norms has a direct influence on wages and bonuses for workers. Keeping records of each pieceworker's performance, including the machine tool operator's, is indispensable. With brigade organization and payment of labor, a different situation is developing. The fulfillment of these norms by each brigade member separately is not directly connected to the size of his wages. Nor does it play a large role in bonuses for workers. Consequently, brigade organization of labor does not, as a rule, require taking the level of the output norms for each worker into account in order to calculate wages and bonuses. In addition, brigade organization of labor intensifies the process of assimilating related occupations and multimachine tool service. When a worker services various types of machine tools, an unequal level of fulfillment of the output norms is evened out and becomes uniform. The result of this is that it cannot be used to calculate production capacity for various types of machine tools.

In connection with this, the problem arises of finding a way to calculate production capacity without using a progressive level of fulfillment of output norms. Its introduction was brought about by the possibility of overfulfilling them significantly. A way out of the situation which has developed is seen in fundamentally increasing the quality of labor norms and in working out real scientifically and technically substantiated time norms (output norms). The system of establishing labor norms being used at the Volga Motor Vehicle Plant, where intensive output norms cannot be significantly overfulfilled, may serve as an example. They are progressive and may be successfully used to calculate production capacity.

The passports of production associations (enterprises) should play a large role in increasing the level of utilization of capacities and equipment. At some enterprises it has become a document containing information on reserves for improving production-economic activity. In the Sumy Machine Building Production Association imeni M.V. Frunze, passports of shops which are necessary for identifying the actual capabilities of each internal subdivision have served as the basis for drawing up the passport of the enterprise. At the Tula Sanitary Engineering Production Association, worker position passports were worked out after the enterprise's passport had been compiled. And special attention is being devoted to reserves for improving capacity utilization, which makes it possible to increase the level of plan intensity and improve enterprise activity. However, in many associations and at many enterprises, passports still do not play any sort of serious role in identifying production reserves, including increasing the efficiency of the utilization of fixed capital and capacities.

In our opinion, one of the reasons the enterprise passport is not used enough to increase the fixed capital yield is the absence of data on the loading of equipment and capacities in subdivisions of associations and enterprises in the passport. A use indicator of average annual capacity characterizes its loading level throughout the association (enterprise) on the whole on a percentage



basis, but does not reveal reserves for increasing it in production units and shops. The passport envisions the equipment work shift index and its loading coefficient both for the association (enterprise) as a whole and for individual types of machine tools and machines. However, the use of these indicators is not revealed on the level of production units and shops.

Information on the loading of a capacity and equipment not only of a production association (enterprise) on the whole, but also of its subdivisions makes it possible to identify reserves for improving the utilization of fixed productive capital. For example, according to the loading coefficient of machine tools and machines at the Taganrog Combine Plant, established in 1981 at 0.77 for metalcutting equipment and at 0.785 for coldstamping equipment, judging reserves for improving their use is still difficult. But when this indicator is interpreted for the 14 basic shops, where it fluctuates between 0.35 to 0.84, not exceeding 0.4 in two shops, from 0.4 to 0.6 in four shops, and between 0.6 and 0.7 in another four shops, then existing reserves for improving equipment loading become obvious.

It is evident that an objective evaluation of machine tool and machine use at the combine plant is possible on the basis of these indicators in the shops. They attest to serious shortcomings in equipment loading at the plant. But according to the generalized data cited in the enterprise's passport, the conclusion may be drawn that in this respect it is more or less satisfactory there.

In a number of cases, equipment use may be accurately evaluated on the basis of generalized indicators also. Nonetheless, backing up average figures with shop data will insure more complete analysis and identification of reserves for increasing machine tool and machine output. For example, in 1981 at the Novocherkassk Electric Locomotive Building Plant, the loading coefficient of metal-cutting equipment in basic production was 0.70, while for forge and press machines it was 0.76. These indicators illustrate a fairly low level of equipment use. At the same time, additional data on the shops give a more detailed description. In the primary shops the loading coefficient of metal-cutting equipment fluctuates from 0.38 to 0.88, while for forge and press equipment it ranges from 0.53 to 1.16.

The examples cited demonstrate that in a number of cases, the generalized figures conceal fundamental deviations from the average quantity. Therefore, frequently shortcomings in the work of enterprises and their subdivisions either go unnoticed or the proper attention is not given to them. Evaluation by average quantities without reinforcing with subdivision indicators may reduce the role of the enterprise's license in identifying reserves for improving production, weaken measures for increasing capacity yield, and distort the representation of the collective's activity.

In a number of cases loading indicators of equipment, obtained on the basis of shop data, attest to significantly larger reserves than report indicators for enterprises on the whole. For example, generalized loading coefficients for the Rostsel'mash Plant and the Taganrog Combine Plant which we calculated on the basis of shop coefficients, do not exceed 0.6, while according to report

data, they are 0.70 and 0.77 respectively. Therefore, in order to give a more objective evaluation of production capacity utilization in the passports of production associations (enterprises), it would be advisable to reflect a number of indicators, including their loading coefficients, not only for the enterprise as a whole, but also for their subdivisions (shops).

Research on reserves for improving the utilization of fixed productive capital in machine building has shown that equipment loading may be increased by more than 10 percent with a two-shift system of enterprise work. Each percentage of this increase makes it possible to obtain additional output worth 2 billion rubles a year.

In accordance with the decisions of the 26th CPSU Congress, building new and expanding existing enterprises should be initiated only when the requirements of the national economy for this type of output cannot be satisfied by improving utilization of production capacities, taking into account their reconstruction and technical reequipping. More efficient utilization of already existing capacities will make it possible to set up series production of new equipment in the shortest possible time and to reduce the need for building new production facilities a great deal, and to liberate a large amount of capital investment.

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## RESOURCE UTILIZATION AND SUPPLY

### JURIST EXAMINES CONTRACTUAL RELATIONSHIPS IN SUPPLY SECTOR

Moscow KHOZYAYSTVO I PRAVO in Russian No 12, Dec 83 pp 34-38

[Article by N. Yakhnina, candidate in juridical sciences: "The Contractual Relationships of Material and Technical Supply Organizations with Suppliers"]

[Text] Stable economic relations, and the strict fulfillment by enterprises and organizations of their assignments to deliver output in established amounts and products lists are a very important condition for the further development and effective functioning of the economy. This is what is said in the 11 April 1983 Decree No 316 of the CPSU Central Committee and USSR Council of Ministers, "On Serious Shortcomings in Observing Contract Commitments to Deliver Output and on Increasing the Responsibility of Ministries, Departments, and Enterprises in this Matter."

In the light of the tasks put forward by the decisions of the 26th CPSU Congress and the June (1983) Plenum of the CPSU Central Committee, it is very important for there to be a further improvement of contract relationships between sales and supply organizations and output producer enterprises, and an expansion of the sphere of application of long-term contracts when there are prolonged economic relations with suppliers.

During the years of the 11th Five-Year Plan material and technical supply organizations devoted a large amount of attention to increasing the effectiveness of contracts and to strengthening their influence on production planning.

In a number of areas the great majority of economic relations are covered by long-term contracts. Thus, in the Moscow City Main Administration for Sales and Supply and in Gosnab of the Azerbaijan SSR the proportion of long-term contracts which were concluded with suppliers for the 11th Five-Year Plan came to 87 percent, while in the Ukrainian SSR it came to 80 percent, and in the North Caucasian region to 84 percent. In these and a number of other areas an expansion of the sphere of the employment of long-term contracts is becoming the chief direction for improving contractual relationships. Long-term economic relations which have been established on the basis of attachment plans are drawn up in the form of these contracts.

At the same time, guiding themselves by the Methodological Instructions on the organization of work for the conclusion of economic contracts for the delivery of production and technical purpose output for the 11th Five-Year Plan which were approved by the 11 June 1980 Decree of Gosplan USSR and the USSR State Arbitration Commission, sales and supply organizations have been taking the necessary measures to conclude long-term contracts on the basis of the annually issued schedule orders for the delivery of output connected with actually developed long-term economic relations. The proportion of such contracts during the 11th Five-Year Plan came to 85.2 percent of the total number of long-term contracts which were concluded between sales and supply organizations and suppliers.

However, despite the extensive development of long-term contracts, in their great majority they have not yet become an effective instrument for ensuring deliveries of output in the assortment and within the schedules necessary for the economy, or an effective means of influencing production. One of the reasons for this is the low quality of many of the contracts.

Taking account of the specific nature of inter-relationships, contracts are supposed to define the full assortment of output, the procedure and the times for agreeing upon it, the demands upon quality and comprehensiveness and on packing and packaging, the output delivery schedule, transportation procedures, and so forth. Within the framework of a long-term contract the sides may provide for mutual commitments aimed at expanding the assortment and improving the quality of output, at the use of progressive forms of packing and packaging, and at other conditions which follow from mutual long-term cooperation.

However, the rights which have been granted to industrial enterprises and material and technical supply organizations are not being used in proper measure by them. Contracts frequently are of a formal character. The specific nature of long-term relations is not always reflected in them. Many contracts do not even contain such necessary conditions as the procedure and time for agreeing upon orders (specifications) for output. Since the law on deliveries does not regulate these issues, their absence in the contract leads to the fact that materials and technical supply organizations present orders which do not correspond to the production planning cycle, that the supplier cannot take account of them during the period of the formation of plans, and the orders themselves frequently do not have a legal character and do not create commitments that they be executed. As a result the requirement stipulated in the 12 July 1979 Decree No. 695 of the CPSU Central Committee and USSR Council of Ministers is not being carried out. According to this requirement, production associations and enterprises have to define in their annual plans the products list and assortment of the output they produce to meet the orders of consumers in accordance with contracts which have been concluded.

In accordance with the Regulation on Output Deliveries, the sides have the right to provide in contracts for the delivery of output of higher quality

and with longer guarantee periods than has been established in the standards and technical specifications.

The condition for the delivery of higher quality output is stipulated only in individual contracts, and, moreover, for the most part not concretely, but through a reference to supplementary agreements which are attached to the contract.

For example, in contracts concluded by the Moskhimsnabsbyt with the Astrakhan' Industrial Rubber Products Plant it is stipulated that when the need arises among buyers for industrial rubber output of special structural properties, sizes, and forms, for new types of materials, and also for higher quality output than is provided for by the All-Union State Standard and the technical specifications, the conditions for the manufacture, delivery, and payment of such output are defined by supplementary agreements of the sides which are an integral part of the contract.

Conditions which define the mutual cooperation of the sides to expand the assortment and improve the quality of output, and to introduce packaging equipment and containers are contained in a negligible number of contracts, despite the fact that long-term contracts provide the sides with such possibilities. These conditions, as a rule, are stipulated on the initiative of suppliers.

Thus, in some agreements which are being concluded by the Kuzbassnabsbyt, Lenmashsnabsbyt, Rostovsnabsbyt, and Volgvyatmashelektrosnabsbyt Associations, the Belmashsnabsbyt Administration, and others, in addition to a detailed regulation on the procedure and times for agreeing on specifications and changing them, conditions are stipulated which are connected with the procedure, during the process of long-term cooperation, by which the supplier enlists the buyer's specialists to participate in the development of the technology for the production of new types of output, and also in work connected with improving its quality. In these contracts the supplier took upon himself the commitments to introduce packaging equipment, containers, and a number of others. However, these conditions are described in a general form, without the necessary detailization, and the commitments established by them are not secured by the necessary measures of property liability.

In a long-term agreement concluded by the Moskhimsnabsbyt Administration for the delivery of conveyor belt it is stipulated that the supplier will perform work to improve the quality of the output and that he commits himself to ensure a consistent improvement of its technical and economic indicators. He informs the buyer of the character of the output quality improvement and of the time that it will be put into delivery no later than 30 days before the beginning of shipment.

In the contract the right of the supplier is established to enlist the buyer's specialists in participating in the development of the technology for the production of products of improved quality, in conducting tests, and in other work connected with the improvement of output quality. The contract

establishes the supplier's obligation to consult with the buyer for a period of six months after the beginning of the delivery of improved types of output on questions of its correct use, and to give him written consultations no later than within 12 days after the receipt of a query. The contract grants the supplier the right to acquaint himself at the buyer's enterprise with the results of the use of the improved output which has been supplied by him, and to demand from the buyer the presentation of responses regarding the results of its use no later than within 10 days after the receipt of a query.

It should be noted that when mutual future cooperation of the sides is regulated in contracts for the most part account is not taken of a specific nature of the inter-relationships with sales and supply organizations which do not operate and do not consume the output they receive.

The Regulation on Deliveries of Production and Technical Purpose Output grants the sides the right to stipulate property liability in contracts for the improper execution of commitments for whose violation sanctions have not been established. For the most part, the sides make use of this right. For example, in two contracts concluded by Moskhimsnabsbyt with the Astrakhan' Industrial Rubber Products Plant provision is made for the payment by the supplier to this administration of a fine of three percent of the cost of delivered output if its quality corresponds to the technical specifications, but does not correspond to the increased requirements stipulated by the contract.

In eight contracts concluded by the Moscow City Electric Appliance Sales and Supply Administration with various suppliers property liability is established for the supplier for the shipment of output without packing.

In individual contracts concluded by material and technical supply organizations fines are provided for buyers for delays in presenting reusable packing when the output being supplied is supposed to be shipped in the buyer's packing.

That which has been set forth above testifies to the fact that far from full use is being made of the reserves for increasing the effectiveness of contracts concluded between sales and supply organizations and producer enterprises, and for increasing their influence on production in order to produce and supply output necessary to the economy: especial attention is directed to this matter in the Decree of the CPSU Central Committee and USSR Council of Ministers "On Additional Measures to Expand the Rights of Industrial Production Associations (Enterprises) in Planning and Economic Operations and to Increase Their Responsibility for Their Work Results."\*

It is essential to further expand the practice of concluding long-term contracts so that these contracts cover all long-term economic relations, both those based on attachment plans and those based on schedule orders which

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\*"Collection of Government Regulations and Decrees," No. 20, 1983, p 109.



are issued every year. However, a substantial proportion of the long-term contracts which are concluded for actual economic relations testifies to existing possibilities for the additional planned transfer of material and technical supply organizations to long-term economic relations with producer enterprises.

In accordance with the Regulation on Output Deliveries in the long-term contract which is concluded for long economic relations the amount of output deliveries is defined for a 5-year period, as a rule, in a group assortment, while the full assortment is defined by specifications; in addition, the procedure and the time for agreeing on specifications and changing them have to be stipulated in the contract. The regulation of these matters in the contract is of great importance.

The process of coming to an agreement on orders (specifications) consists of several stages: the sending of an order by the buyer to the supplier; the acceptance of the order; and the settlement of differences which arise. A similar procedure occurs when changes in previously presented orders are agreed upon. Each stage of this process has to be provided for in the contract with the stipulation of the concrete procedure and dates which are coordinated with the dates of the formation of the producer enterprise's production plan. The incompleteness of the contractual regulation of these conditions leads to vagueness in the relationships between the sides and reduces the influence on the contract on production; and it has a negative effect upon the quality of supplies for consumers.

The Regulation on Output Deliveries has established legal guarantees that the supplier will provide satisfaction during the process of agreement of consumers' specifications (orders) of assortment requirements. In accordance with it, the sides are guided by lists of output that is subject to manufacture and delivery which are worked out and approved for manufacturers with regard to their specialization by ministries, state committees, and departments with the participation of Gosplan USSR. The procedure for the development and approval of the lists was approved by a decree of Gosplan USSR on 16 May 1980. According to this procedure, the working out of the lists has to be carried out with regard to the extensive introduction into production of the achievements of scientific and technological progress, and the prevention of the production of obsolete output which is not in demand. They provide for a group products list (assortment) with a specification, as a rule, within the limits of the group of a full products list (assortment) of output which is subject to manufacture and delivery. As a rule, they are worked out for a 5-year period.

The lists of output which is subject to manufacture and delivery represent the full specialization of suppliers, and have the task of ensuring the realistic nature of the orders presented by consumers, reducing the number of disputes during the process of agreeing on assortment, and simplifying their examination. Their legal significance is established by the fact that the Regulation on Deliveries establishes the obligation of the supplier to accept consumers' orders for execution in the products list (assortment) necessary

to the consumers, if these orders are presented in accordance with an approved list within the limits of the amount of output provided for in the deliveries planning documents.

In accordance with this, supply agencies which conclude contracts with suppliers have to take measures to ensure them with approved output lists and to present orders in accordance with these lists. When there is an unwarranted refusal by the supplier to accept orders, the disagreements should be handed over to arbitration agencies for examination.

A long-term contract makes it possible to regulate the long-term cooperation of the sides in the production and delivery of new, more economical, and progressive types of output, and to consistently improve the quality of output.

Toward these ends, provision should be made in the contract for the right of the consumer-material and technical supply organization to present the supplier with forward-looking orders for new types of output needed by it so that these types of output will be put into production, and also for output with improved technical and economic indicators. Measures for the introduction into production and the delivery of such output could be jointly worked out by the sides as an integral part of the contract. In the measures it would be advisable to stipulate the amount, character, and time of the performance of the necessary work, the time for the introduction of the output into production and for its delivery, and also the procedure for the participation by the customer's specialists and consumers enlisted by the customer in the realization of this work. The contract could also regulate the procedure for providing the customer with information on new types of products which have been prepared by the supplier for introduction into production, and on output of improved quality and assortment.

In necessary cases, proceeding from the specific nature of the output being delivered, the contract should provide for the obligation of the supplier to consult the customer and consumers indicated by him on the correct use and operation of the new or improved types of output, and the contract should also stipulate the procedure for providing such consultations.

In defining the quality and comprehensiveness of output in the contract the point of departure should be the Regulation on Deliveries which provides the sides with extensive rights in establishing conditions in the contract aimed at ensuring the interests of buyers and at the delivery of output of better quality compared to the standards and technical specifications, and also with longer guarantee periods; and the delivery of products in addition to the comprehensive set, or without individual products which are a part of the set but are unneeded by the buyer. If comprehensiveness has not been defined by the pertinent technical normative documentation, it can be defined in the contract. The delivery of output in individual parts of the set, and also their shipment by schedule may be included in the contract.



The Regulation on Deliveries makes it possible to define in the contract, in addition to the completeness of output, the completeness of its delivery as well; that is, the delivery of equipment, appliances, and other products in their total aggregate.

The time and procedure of a delivery has to be established in the contract with regard to the fact that the supplier is bound to ship output in accordance with minimum shipment norms. For this reason, in the event that output is allocated in an amount less than three minimum shipment norms intra-quarter delivery periods should be established in the contract. If the receiver is an organization of material and technical supply, then in accordance with the Regulation of Deliveries, the supplier is obliged to ship the entire quarterly amount at a single time, if this amount is less than the minimum shipment norm. However, in this case it is advisable to stipulate in the contract a shipment period for such output within a quarter, since otherwise the supplier will receive the right to ship the entire quarterly amount on the last day of the quarter.

In order to ensure the rhythmical nature of deliveries the shipment and delivery of output according to a schedule agreed upon by the sides may be stipulated in the contracts, as well as the procedure and the time for presenting and agreeing upon schedules.

As an integral part of the contract, the supplier and the customer may jointly work out measures connected with the introduction and use of progressive types of packing, packaging, and packeting equipment with a specification of the time they will be introduced into deliveries.

In keeping with the rights which have been granted to the sides by the Regulation on Output Deliveries the commitments stipulated in a contract have to be backed up by the appropriate sanctions if property liability for their violation is not regulated by existing law. In particular, it would be advisable to establish liability for the failure to carry out measures agreed upon by the sides on the expansion of assortment, an improvement of output quality, and the use of progressive types of packing and packaging.

In order to improve the quality and effectiveness of contracts and to help the sides in determining necessary conditions it would be advisable to develop and introduce into practice a Model Contract for the Delivery of Output by a Production Association (Enterprise) to a Material and Technical Supply Organization. This kind of contract could be approved by a decree of Gosplan USSR and the USSR State Arbitration Commission.

In order to strengthen the role of the contract in the planning of production it would be useful to develop a methodology for the formation of enterprise production plans on the basis of contracts and the orders of consumers and sales and supply organizations.

The development and strengthening of the cooperation of sides on the basis of long-term contracts and an expansion of their economic initiative would be

promoted by a normatively fixed right to define in contracts the economic stimulation of suppliers for the adoption of intense commitments, for the realization of measures to expand assortment and improve output quality which have been stipulated by a contract, for the delivery of output in economical consignments and reduced time periods, in accordance with agreed-upon schedules, and so forth.

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## RESOURCE UTILIZATION AND SUPPLY

### WAYS TO ENFORCE SUPPLY CONTRACT OBLIGATIONS EXAMINED

Moscow PLANOVVOYE KHOZYAYSTVO in Russian No 2, Jan 84 pp 45-51

[Article by V. Slobodnik, candidate of economic sciences, and V. Maslennikov, candidate of economic sciences: "Ways of Improving Fulfillment of Obligations Relating to Product Deliveries"]

[Text] The fulfillment of targets for deliveries of products of the technical industrial type and of consumer goods is one of the most important indicators of appraisal of the operation of enterprises and associations. Balance and elimination of disproportions in the national economy largely depend on its attainment.

The decree of the CPSU Central Committee and the USSR Council of Ministers "On Additional Measures for Expanding the Right of Production Associations (Enterprises) of Industry in Planning and Economic Activity and for Increasing Their Accountability for Work Results" states that observance of contractual obligations for deliveries of output is a condition of successful realization of the course taken by the party for intensive development of the economy and bolstering of its effectiveness, one of the chief indicators of evaluating the operation of sectorial ministries, production collectives and their heads.

But production associations and enterprises to a large degree up to the present time have had as their aim fulfillment of the plan for total volume of production and sale of output rather than adherence to delivery commitments. Thus enterprises and associations of the Ministry of Machine Building for Animal Husbandry and Fodder Production, working on the whole at a regular pace, in March 1983 exceeded the plan for normative net output by 2 percent and for total volume of sales--by 22 percent. At the same time, delivery targets were only fulfilled 98.2 percent.

It is emphasized in the aforesaid decree of the CPSU Central Committee and the USSR Council of Ministers that the chief criterion of appraising the operation of enterprises should be the indicator of output sales volume, with account being taken of the fulfillment of contractual obligations.

At the same time, it is noted that debtor enterprises are considered as not having fulfilled the plan, and the size of material-incentive funds, calculated according to other indicators, is reduced at the following rate: for each

percent of nondelivered products, 3 percent of the amount of the material-incentive fund is withdrawn. Such a measure makes it possible to increase the economic accountability of suppliers to consumers.

In recent years, the foreground in the system of material incentives has been assumed by fulfillment of product-delivery commitments for products list and assortment in conformity with contracts. The consumer can act on the supplier through a reduction of economic-incentive funds on the basis of the indicator of product sales while taking into account contracts and through fine sanctions specified in the appropriate normative acts or concluded contracts.

The dependence of economic-incentive funds and bonuses on product sales, with account being taken of delivery targets, is included in the general system of evaluative indicators. But enterprises in many cases find it possible to fulfill and overfulfill plans for total volume of production, profit, labor productivity, growth of the relative share of products of the highest category of quality and so on while not having as an aim the observance of commitments in regard to consumers. In this connection, reduction of bonus funds because of incomplete deliveries of products is covered completely or partially by deductions at the expense of other indicators.

Beginning with 1982, the maximum permissible percent of delivery shortage has been reduced to 2 percent and only in individual exceptional cases to 3 percent. The results of the work show that this decision has had a positive effect on delivery discipline. At the same time, reduction of the maximum permissible percent is not always reinforced with rearrangement of organizational work dealing with the development of a plan for the products list and its balancing with material and labor resources and production capacities; improvement of operational-production planning; provision of strict control over the timely shipment of products to consumers.

Employment of the maximum permissible percent of delivery shortage leads to uncertainty in economic relations among enterprises, associations and higher organizations. The consumer, after having concluded a contract, does not know to the last moment whether the manufacturer will fulfill the delivery plan. Yet he is obliged to prepare his production while taking it into account. The introduction of the maximum permissible percent reduces the obligation of a specific supplier, since the higher organization, on approving this percentage, partially assumes this obligation.

Its employment attests to the fact that planning and supply organs cannot at the present time resolve the problem of delivery shortages of products solely on the level of association or enterprise.

The introduction of a maximum permissible percent of delivery shortage is a necessary but forced measure aimed at providing enterprises and associations with time for solving organizational problems interfering with the fulfillment of commitments relating to product deliveries. Enterprises should carry out an analysis of the reasons for disruptions of contractual deliveries and work out measures for their elimination.

Major importance is also attached to fine sanctions in strengthening the mutual economic responsibilities of the supplier and the purchaser. Their effect on the cost-accounting interests of the supplier is manifested through a reduction in the amount of profit and of the purchaser through covering of the material loss. But fine sanctions do not compensate the purchaser for material loss from delivery shortages of raw and other materials as well as of component items and are not always used. The fine is paid from the total amount of profit and so on.

In this connection, proposals are often made on the need to increase amounts of fines and to tie them in directly to the size of the economic-incentive funds. The supplier should also be affected by being penalized for the loss incurred by the consumer as a result of the supplier's nonfulfillment of contractual obligations based on the size of actual losses. Certain sanctions apparently should also be applied to administrative organs, defects in whose work could exert a most direct influence on the fulfillment of product deliveries.

The task does not consist of a simple increase of fine size but rather of creation of such conditions where supplier-enterprises, in fulfilling the plan of production and deliveries, satisfy thereby the requirements of consumers for assortment and product delivery times. This is possible only in the case where the plan is formed while taking into account the orders of consumers. In practice, this requirement is not fully realized.

At the present time, this principle of forming plans is utilized only in organizing deliveries on the basis of direct long-term economic ties. The work practice of large associations on their basis shows that a considerable economic effect is produced when the interested parties (manufacturers and consumers) are bound by mutual commitments for expanding product assortment, providing technical assistance in the process of the manufacture and use of new types of products, transporting them and adopting and using progressive types of containers and packaging.

But the realization of direct long-term ties is restrained by a whole series of circumstances. Their establishment often does not take into consideration the operating conditions of suppliers and consumers. Up to the present time, products of the same type have been delivered to consumers simultaneously through direct ties and with the aid of the drawing-up of regular supply orders.

The problem has also not been resolved of tying in the results of operation of enterprises based on direct long-term ties with cost-accounting indicators of their work. Fulfillment of the customer's requirements creates additional expenditures for the manufacturer connected with the introduction of new production processes or modification of already existing ones. The end result justifies these expenditures, but the consumer wins from this, for which reason a general-purpose order, which does not take into consideration the needs of consumers in regard to improvement of qualitative parameters, is of benefit to the manufacturer.



Ministries and all-union industrial associations, under whose jurisdiction questions of concentration and specialization of production are to be found, are paying insufficient attention to the problem of establishment of long-term ties. Their proposals are not always sufficiently valid. This upsets the stability of the ties and consequently reduces the influence of the consumer on the production process.

In evaluating the operation of enterprises and associations, the transition from the total volume of product sales to the consideration of the specific sum total of contracts and orders cannot be isolated from an evaluation of other sides of their operation. As one of the basic end results of operation, the delivery of products on schedule in accordance with contracts includes the producer within the range of interests of the national economy as a whole. Consequently, use of the indicator of product sales while taking into account targets for their deliveries makes severe demands on the organization and planning of production at all levels of management both within the production association and enterprise and also on the level of the subsector, sector and the national economy as a whole. Experiments conducted in a number of sectors of machine building, construction, transport were unable to fully show the total complexity of the economics of the individual production association or enterprise. Complex experiments have not been conducted in a single sector on the use of economic measures while taking into account their influence on the fulfillment of contractual obligations for product deliveries.

The present stage of the economy's development requires increased responsibility of ministries for the fulfillment of targets for product deliveries. This is one of the most important national-economic problems. Its successful solution requires knowledge of the consumer's demand for basic types of products, that is, the forming of a production plan according to the degree of satisfaction of the needs of clients (purchasers) for end products, which is a task of head ministries responsible for the output of this or that product. But methodological provisions, formulating their rights and obligations, do not exist. Consequently these ministries in practice cannot fully carry out coordinating functions.

Analysis of the basic factors responsible for the nonfulfillment of delivery targets shows that they are divided into internal, which are connected with the work of the collective of the production association or enterprise, and external, which do not depend on the efforts of production collectives. External factors include: nonfulfillment of commitments by suppliers and subcontracting plants, low level of operation of transport, supply and sale organs and higher organizations as well as inadequate operation of such elements of the economic mechanism as evaluation and motivation of fulfillment of obligation and manner of payment for product deliveries. The external factors are thus connected with the operation and cooperation of organs of planning, material-technical supply and economic management.

Internal factors include: nonfulfillment of production plan in terms of product lists and assortment; uneven work of associations (enterprises); lack of coordination between delivery targets and plans of material-technical supply,

production and sales; lack of correspondence of the systems and methods of day-to-day planning to contemporary production management requirements, product deliveries and others.

Both groups of factors are closely interrelated and mutually condition each other. But it is difficult to agree with existing opinion that external factors are allegedly the sole cause of non-fulfillment of targets and commitments to consumers. Such an opinion is also widely prevalent among higher organizations. Consequently most of their decisions on improving the economic mechanism within enterprises repeat general instructions and regulations and do not take into consideration the specific and individual operating conditions of a sector's enterprises and associations. This applies particularly to the detection and elimination of causes resulting in a shortfall in the delivery of ordered products on time.

According to data of enterprises of the Ministry of Construction, Road and Municipal Machine Building and the Ministry of the Electrical Equipment Industry, approximately 60 percent of all causes of nonfulfillment of targets for product deliveries come under internal factors. In 1980, in the electrical equipment industry alone, about 44 percent of the products failed to be delivered because of nonfulfillment of the production plan. Nonobservance of contractual obligations on the part of suppliers, as shown by the work practice of enterprises, results in increasing the number of refusals to pay for the products. Their total amount contains a great portion of bills for payment of products not ordered by consumers. Other reasons for refusals are demands to pay for previously delivered products, bills for unreceived goods, violations of delivery schedules and disparity between the quality of goods and the conditions of the contract.

Among external and internal factors affecting the fulfillment of delivery targets, there are those which are of identically great importance to both groups. They include first of all level of plan and performance discipline. Plan discipline is made up of production, labor, financial and organizational discipline (right down to the organization of production units) as well as discipline of material-technical supply, direct economic ties and cooperation. Strengthening of plan discipline at the level of the top level of management is a consequence of it being raised at associations and enterprises and in their internal subdivisions. The experience of working out and realizing production plans and the analysis of their coordination with product delivery targets shows that a special feature of the present stage of development of the country's economy is the requirement of unity of planning at all levels of management. It is not being fully realized in practice. Thus, the procedure, which has justified itself, for compiling plans, taking into account the most important product list approved by the USSR Council of Ministers, USSR Gosplan and an all-union industrial association, is not brought down to the lower levels in such a break-down. As a result the specific executive receives a general-purpose target, which influences delivery discipline and leads to the fact that the executive often cites those reasons for non-fulfillment of delivery targets which it is impossible to check. This lends a passive character to intraproduction planning and determines a formal approach to the use of the enterprise's internal reserves.

Among the most important factors contributing to a product delivery shortfall, there is first of all a low level of day-to-day production planning. Ministries and all-union industrial associations pay insufficient attention to this direction in the improvement of production organization and planning. The methods of day-to-day production planning employed since the '60s at machine-building enterprises have practically remained unchanged, although the operating conditions of associations and enterprises have become more complex.

Practice shows that the development of forms and methods of production organization at large enterprises occurs at a slower tempo compared to the growth of its technical equipment. A gap is formed between the level of utilized equipment and the technology and organization of labor. Such ministries as the Ministry of the Electrical Equipment Industry, the Ministry of the Electronics Industry, the Ministry of Instrument Making, Automation Equipment and Control Systems and several others do not have within their organization an organ assigned to improve the methods of day-to-day production planning while taking into account changes in the level of socialization of production. In those sectors where such organizations do exist, for example, the Central Scientific-Research Institute for the Design of Organization and Management Techniques of the Ministry of Instrument Making, Automation Equipment and Control Equipment of the Ministry of (Minsk), the State Planning, Technological and Experimental Institute for the Organization of the Machine Tool Industry (Moscow) and NIIAP [expansion unknown] (Kharkov) of the Ministry of Machine Tool and Tool Building Industry, the levels of regularity of production and fulfillment of product deliveries are significantly higher.

Party and government decisions on improving the economic mechanism emphasize the necessity of changes in production and planning organization at associations and enterprises. But analysis of plans for the 11th Five-Year Plan developed by enterprises, associations, ministries and departments showed that they practically contain no measures for improving the management mechanism within enterprises and associations.

In our opinion, this is to be explained by the fact that over the course of many years, most enterprises, associations and even sectors of the national economy operate irregularly and do not fulfill delivery targets. The problem of regularity of production up to now is slow in being solved. Many associations and enterprises produce more than half of their output in the third 10-day period. Thus for the Ministry of Electrical Equipment Industry regularity of production of products to be marketed in 1980 comprised in the first 10-day period--18.9 percent, in the second--27.3 percent and in the third--53.8 percent. The figures are even worse for some production associations of this ministry. At Soyuzelektroterm Association, 64.7 of the output was produced in the third 10-day period, at the Soyuzelektrotransmash--72.0 percent and at Soyuzelektrotekhnologiya Association--79.3 percent.

A similar situation exists at other enterprises. At Kharkov's Svet Shakhtera Plant of the USSR Ministry of Coal Industry 7.4 percent of products to be marketed were produced in the first 10-day period, 17.1 percent in the second 10-day period and 74.9 percent in the third. For this reason deliveries relating to conveyor and spare parts were not completely fulfilled.

Investigation of a number of production associations and enterprises showed that their irregular work is due to internal lack of organization and noncoordination of the operations of individual performers at different stages of production. Day-to-day production planning and production management has been made difficult with the complication of ties and development of specialization and cooperation. In the investigation of the associations and enterprises, it was elucidated that day-to-day production planning basically includes the production stage and occasionally testing. Preparation of production, material and technical supply and product deliveries remain outside its sphere.

As a result, the basic causes of irregular production and product deliveries are: an inadequate stockpile of component parts and components, absence of proper control over the course of production and product shipments, partial use of equipment and so on.

Among the defects there is also absence of centralized planning and cooperation of production units in the manufacture of assemblies, units and parts for the purpose of coordinating product delivery times. Consequently cases are to be encountered in practice where many shops unjustifiably increase the output of parts and units in comparison to the quantity assigned by the planning-production control department. As a result, the volume of unfinished production increases artificially and outlays of labor and materials mount.

Moreover, putting a product into production is often done without taking into account the needs of consumers, the presence of component items in storage and also the real work possibilities of their suppliers. Cases are frequent where in the course of a month, the shops' products-list plan is changed several times. For example, at the Leningrad Construction Machinery Plant, the products list plan is corrected on the average 12-14 times a year, at Kostroma's Stroymashina Plant--15 times. For this reason, assembly shops operate under conditions of shortage of component parts, and the selection of products for shipment to customers is not done in accordance with a time table but on the basis of the amount coming from these shops. Large reserves of unfinished production become concentrated, above-norm stocks of materials grow from month to month and the products-list tracking of the movement of products at different stages of their manufacture is made difficult.

At the same time, many associations and enterprises operate in industry that constantly fulfill delivery targets 100 percent. They include the Slava, Svetlana, LOMO and ZIL production associations, the Vladimir and Minsk tractor plants and others. But their methods of organization and planning of product deliveries so far have not been adequately disseminated even among related enterprises of the sector.

At many enterprises and associations, counterplans do not provide for improvement of fulfillment of product delivery targets. During the years of the 10th Five-Year Plan, not a single enterprise or association of the machine-building industry adopted a plan containing the obligation if not to fully fulfill delivery targets then to at least improve the percentage of their fulfillment compared to the preceding period.



The study and generalization of advanced work experience of enterprises and associations make it possible to outline the basic direction of improving day-to-day production planning. This requires the development and introduction of a system of planning and control of production and product deliveries on the basis of fulfillment of contractual obligations. One of its tasks should be the definition and support of planning and control with the aid of network schedules and regular fulfillment of the portion of the annual (quarterly, monthly) plan of production and product deliveries falling within a given period by an association (enterprise). The subject of control of such a system would be all types of products made by an enterprise or association, first of all output being sold taking into account concluded contracts (orders accepted for execution).

In addition to the stage of direct production, the system of day-to-day production planning should include the stage of its preparation, material-technical supply and product deliveries. In our opinion, for the purpose of introducing the said principles of this system's organization, it is necessary to carry out a reorganization of a number of departments of the enterprise (association) after creating a special Bureau of contracts and orders, which could be assigned the following tasks: effective control over the course of production and the fulfillment of contractual obligations; participation in the compilation of quarterly and monthly production plans; coordination with the department of supply and replenishment of the need for components for the purpose of supplying production with them in a timely fashion; reporting to higher organs on the fulfillment of delivery targets and effective communication with customers; carrying out of an integrated analysis of internal reasons for nonfulfillment of delivery targets and working out of concrete measures for eliminating the reasons for nondelivery of products (with inclusion of them in the plan of organizational and technical measures) for the purpose of providing production (where this is necessary) with suitable labor and material resources.

Thus, ensuring fulfillment of contractual product deliveries is a complex problem encompassing different levels of planning and economic management and of all participants in the manufacture of products and getting them to the consumer. Aside from the problems mentioned in the article, the following questions await their resolution: the effect of better organization of work and economic incentives in transport organizations on product deliveries; introduction of measures for improving material-technical supply (direct long-term economic ties, guaranteed complete supply and others); coordination of all normative legal acts for the purpose of their orientation to the creation of legal conditions for equal responsibility of the supplier and the customer over observance of contractual obligations and others.

The defects pointed out in the article should not be considered as a justification for undisciplined work on the part of suppliers. From the day of adoption of the decree of the CPSU Central Committee and the USSR Council of Ministers on observance of contractual obligations for product deliveries, sufficient time has passed to eliminate defects and to reorganize the style and

work methods of ministries, departments and enterprises. It should not be forgotten that the delivery plan is a law, and its fulfillment calls for daily work in regard to installing order and discipline in the observance of contractual obligations.

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## ECONOMIC MODELING AND COMPUTER TECHNOLOGY APPLICATION

### KANTOROVICH, MAKAROV DISCUSS EQUILIBRIUM MODELS, PRICES

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[Article by L. V. Kantorovich and V. L. Makarov: "Prices and the Efficiency of Production"]

[Text] Prices play a very important role in the economic life of society. In a planned socialist economy they perform the most important functions in adjusting the continuous operation of the entire economic mechanism, assessing the costs and results of public production and stimulating the effective activities of all elements of the national economy.

Prices have a diverse role. They determine a measure for comparing various types of products and resources. Because of this, prices are constantly used in making economic and planning decisions. They are also tools for aggregation and the evaluation of results from productive activity and a means of balancing production and consumption. Therefore, a system of prices, forecasts of its change and a price formation mechanism have substantial influence upon the economic activities of society, production, consumption and distribution, on the efficiency of the economy, in particular upon the use of resources (labor, natural, productive capital, scientific-technical potential) and upon the satisfaction of demand.

Economists have always given great attention to the nature and essence of prices. This problem has a prominent place in the creative legacy of V. S. Nemchinov. Yu. V. Andropov, [late] CPSU Central Committee General Secretary and USSR Supreme Soviet Presidium Chairman called the principles of scientifically based price formation one of the especially urgent problems in the selection of reliable paths for improving production efficiency, the development of which the party and state are expecting of economists.

This article, not pretending to be any kind of complete survey of views, theoretical and practical aspects of price theory, is restricted to an examination of new contributions of mathematical economics, in particular optimal planning models, to understanding the role, essence and functions of prices at the present stage in society's development and to the significance of these results for practical economic affairs.

# 1. Prices and Models of Economic Equilibrium

Like many other sciences, mathematical economics studies idealized objects, distinguishes any situation in its pure form, removed from accompanying factors always present in reality. A model of economic equilibrium is one such idealized object. It reflects certain features of existing economic systems, but does not even approximately describe a single one of them. This model interests us because it casts light on some important properties of prices.

Thus, we take for an example a quite general economic equilibrium model, the one proposed by K. Arrow and G. Debreu [1]. Let products be designated by indices  $k = 1, \dots, n$ , consumers by  $i = 1, \dots, n$ , producers by  $j = 1, \dots, m$ . The model sets:

$$(X_i, w^{(i)}, u_i)_{i=1}^n, (Y_j)_{j=1}^m, \theta = \|\theta_{ij}\|,$$

where  $X_i$  is a set, lying in the product space  $R^Q$  of feasible consumption vectors for consumer  $i$ ;  $w^{(i)}$  the initial stock of products; and  $u_i$  a preference function;  $Y_j$  -- a production possibilities set for producer  $j$ ;  $\theta_{ij}$  -- the share of profits from producer  $j$  received by  $i$ ; and  $p$  -- a price vector.

The equilibrium state is a vector  $\bar{z} = (\bar{x}^{(1)}, \dots, \bar{x}^{(n)}, \bar{y}^{(1)}, \dots, \bar{y}^{(m)}, \bar{p})$ , satisfying the conditions:

$$\begin{aligned} \sum_i \bar{x}^{(i)} &\leq \sum_j \bar{y}^{(j)} + \sum_i w^{(i)}, \\ \bar{y}^{(j)} \bar{p} &= \max_{y \in Y_j} y \bar{p}, \quad j=1, \dots, m, \\ u_i(\bar{x}^{(i)}) &= \max_{x \leq \sum_j \theta_{ij} \bar{y}^{(j)} \bar{p} + w^{(i)} \bar{p}} u_i(x), \\ x &\geq 0, \bar{p} \geq 0, \sum_k \bar{p}_k = 1 \end{aligned}$$

Under definite, but quite general assumptions it can be proven that an equilibrium state exists and that any equilibrium state is efficient, i.e., the point

$$u = (\bar{u}_1(\bar{x}^{(1)}), \dots, \bar{u}_n(\bar{x}^{(n)}))$$

lies on the Pareto boundary for the set

$$U = \left\{ w \in R_+^n \mid u_i \leq u_i(x^{(i)}), x^{(i)} \in X_i, y^{(i)} \in Y_j, \sum_i x^{(i)} \leq \sum_j y^{(j)} + \sum_i w^{(i)}, \right. \\ \left. i=1, \dots, n, j=1, \dots, m \right\}.$$



These two results on the existence and efficiency of the equilibrium state show that it is theoretically possible to have prices equalizing supply and demand under conditions where every producer strives to maximize profits and every consumer strives to maximize the satisfaction of demand within a budget constraint. Moreover, this balanced state ensures the maximum social welfare measured as the weighted sum of individual consumer preference functions. These results are mathematical support for A. Smith's postulate about the "invisible hand", ensuring the balance of supply and demand for commodities in capitalist society in spite of the fact that each commodity producer is only oriented towards price and strives to maximize his own profit. In such a case the "invisible hand" guarantees the efficiency of the balanced state.

The question arises as to what price theoretical conclusions can be drawn from such results relating to the concept of "perfect competition" or even the narrower Arrow-Debreu model. Apparently, in some situations prices can be a tool for ensuring the balance and efficiency of production and demand. Probably the majority of economists agree that such situations do not occur in a pure form in a modern economy. Therefore, we note that at present prices can, under some conditions, have useful properties for equalizing supply and demand and for ensuring efficiency. Would it be possible to build a contemporary capitalist economy along the lines of a world of "perfect competition"? Many theoreticians in the West have studied this question. Even today there are many adherents to the view that such an economy is the ideal towards which to strive. We will point to four circumstances, each of which "torpedo" the concept of "perfect competition".

Let us turn again to mathematics. Designate by  $E(p)$  the surplus demand vector at prices,  $p$ :

$$E(p) = \sum_i x^{(i)}(p) - \sum_j y^{(j)}(p) - \sum_i w^{(i)},$$

$$\begin{aligned} y^{(j)}(p) &\in \arg \max_{y \in Y_j} yp^*, \\ x^{(i)}(p) &\in \arg \max_{x \geq 0, xp < \sum_j \theta_{ij} y^{(j)}(p)p + w^{(i)}p} u_i(x), \end{aligned}$$

It has been proven that a solution to the system of differential equations  $\dot{p} = E(p)$  converges towards the equilibrium price vector  $\bar{p}$  only under very strict conditions (see, for example, [2]). This means that even theoretically there can be breakdowns in the market mechanism for price determination.

Furthermore, the equilibrium state yields a maximum to a welfare function in the form:  $\sum_i \alpha_i u_i(x^{(i)})$ ,

where  $\alpha_i$  is a number characterizing the "weight" of consumer  $i$ . To put it bluntly, the weight of  $\alpha_i$  is proportional to the value of the means of production possessed by this consumer. The apologetic essence of this principle of distribution hardly requires commentary.

\* In other words,  $y^{(j)}(p)$  -- is one of the elements  $y \in Y$  at which a maximum is attained.

A third circumstance is that "perfect competition" assumes that absolutely all goods (or anti-goods, that is, harmful products) can, without exception, be given a price in an economic sense. In actuality, many goods do not satisfy this assumption. This is not only due to moral or specific constraints, but simply to technical reasons. For these reasons it is difficult to evaluate the economic welfare from the public use of roads, lighthouses, street lights, clean air, etc, or of individual wealth such as certain kinds of knowledge of prestige. For technical reasons it is obviously quite impossible to put a price on benefits such as the satisfaction from safety, from confidence in tomorrow, or a country's achievements in science, sports and art. In short, there is quite a lot of wealth which is very difficult or impossible to buy or sell.

The fourth, and perhaps the most important circumstance which makes it impossible to give a practical interpretation to the theorem on the convergence to an equilibrium state and on the efficiency of this state, consists of the following.

The convergence theorem is based on the iterative repetition and correction of economic acts. However, short-term and repeated acts (current production, delivery and sales) by no means account for all functions of the economy. An important role is played by long-term and often irreversible acts: production with a prolonged cycle, the construction and creation of fixed capital and the long-term personal and social use of goods. Obviously, when these factors are taken into consideration, it is not realistically possible to attain equilibrium with the help of the competition and price mechanism.

Unregulated oscillating processes are inevitable. Because equilibrium is impossible in a system of perfect competition (*Laissez faire*) there is no foundation for asserting that a capitalist economy can reach an efficient state through this means.

However, even if, on the basis of some stability in statistical data, it is thought that under slowly changing conditions a coarsely aggregated form of a freely competitive economy might, in a roughly approximate manner, be described by some equilibrium model, for example, a dynamic intersectorial balance model and its corresponding price system, it cannot be concluded that it is actually efficient (or optimal). Nevertheless, such conclusions are encountered in the literature. For example, J. Schwartz [3], on the basis of a detailed mathematical analysis of a dynamic model with familiar stipulations comes to the conclusion that the resulting theorem (the main theorem of economics) on the maximum growth rate attained in the model can be interpreted to mean that no kind of planned system can have a greater production growth rate than the growth rate of income under free competition.

When the model is interpreted as resulting from a statistical description of a real economy, the outlay coefficients themselves do not reflect technical norms, but expenditure indicators for a real economy, including losses due to irrational functioning. Losses from unsold output, lack of balance or linkage between unutilized reserves and production capacity, less than full employment, declines in production, etc. are unavoidable where information is lacking and there is no coordination of decisions. Thus, in comparing this economy with a

planned one, there should not be a mechanical transfer of the characteristics of current and capital outlays. One should be oriented towards the norms inherent in this more improved system of functioning. In other words, even at the same technical level, the outlay norms in a socialist economy should be considerably lower. The inverse is then obvious: the growth rates of a controlled economy can be somewhat higher. This has repeatedly been proven by practical experience.

Thus, perfect competition is detached from reality and its merits are by no means supported by thoughtful analysis. It is well known that it is unsuitable as an ideal for practical work. It is therefore far from clear to what extent it can serve as a basis or even a guideline for prices in a real economy.

## 2. Prices and the Optimal Plan

As an economic category prices are inseparable from the mechanisms of their formation and application. Where and how prices are used have a substantial effect upon their role and influence upon the economy. It is not proper to view prices in isolation from an incentive system, from the period and procedure in which they are set, the types of activities and calculations in which they are used, etc. Prices are one of the main components in the economic mechanism and their nature can be understood only in inseparable connection with the remaining components. Prices will have a greater role in an economy where the economic mechanism is more important for decision making. The economic mechanism's main task is to ensure the efficiency of current management and planning decisions. This requires that calculated economic efficiency reflect such (actual, desired) efficiency. The economic efficiency of a given measure usually means that its total results exceed total outlays expressed in value form using existing (or future) prices.

So, from our point of view, the main function of prices is to make it possible to obtain a correct social evaluation of a measure's efficiency. The idea of (actual) efficiency can be defined through global criteria of optimality, in particular through an optimal plan for the development of the economy.

An optimal plan is a theoretical idea. It is more accurate to speak of a conditionally-optimal plan, although this term is still not used in this sense in the literature. A plan is optimal when a number of quite strict, specific conditions are precisely met. In particular, these are: 1. The initial information is correct and completely reflects the actual possibilities, needs (and preferences) of producers and consumers; 2. It is expressed in known general (global) optimality criteria; 3. This plan is the best with available information about possible alternatives from the perspective of such criteria.

Even though a plan becomes optimal only when these conditions are met, there are properties characteristic of any plan which is optimal in a weaker sense (according to different criteria, etc). The main such property -- efficiency -- requires that the plan lie on a boundary of the set of all possible or feasible plans [4,5]. If it is an interior point of the set of feasible plans, this means that it could be improved for all indicators simultaneously and consequently, could not be optimal for a single (reasonable) criterion. From the theory of extremal problems with constraints it is well known that efficient plans, and

in the convex case, only these plans, are characterized by valuations (or, using other terminology -- resolving multipliers, optimal valuations, objectively conditioned valuations, shadow prices).

The following provides a clear example of the mathematical meaning of dual valuations. Let  $z = (z_1, \dots, z_n)$  be a vector describing a production plan (negative components show costs, and positive, output), and the set  $Z$  of all feasible (possible, present) plans (methods) of production be a closed convex cone in an  $R^n$  space. This means, in particular, that each feasible method be used at any intensiveness, costs and outputs change proportionally; the simultaneous use (application) of two methods is also feasible. A plan  $\bar{z} \in Z$  is efficient if there is no  $\tilde{z} \in Z$  such that  $\tilde{z} \geq \bar{z}$  and  $\tilde{z} \neq \bar{z}$ . In accordance with separation theorems for convex sets there is a hyperplane  $H$ , passing through the point  $\bar{z}$  such that the entire set  $Z$  lies on one side of it. If a vector normal to  $H$  is designated by  $p$ , then this property is written  $p\bar{z} = 0$ ,  $pz \leq 0$  for all  $z \in Z$ . Components of the vector  $p$  are dual variables describing the efficient method of production  $\bar{z}$ . If  $p$  is interpreted as the "price" of products, then the scalar product  $pz$  indicates the magnitude of "profit" for the method  $z$ . Thus, any efficient method of production  $\bar{z}$  fulfills the equality of cost and result valuations, while for inefficient  $z \in Z$ , total results do not exceed costs. In other words, with efficient methods the value (in characteristic prices) is preserved, while for inefficient ones it declines.

From here on, the terms "prices of the optimal plan", or sometimes "optimal prices" will be used for characteristic "prices", which are linked to a given optimal plan as an effective production method. Only prices in the optimal plan can distinguish efficient (those used in the optimal plan) from inefficient methods, using the standard method for comparing costs and results. The reverse assertion is also true. Given a collection of prices, their separation, with the help of the set of possible production methods, into efficient and inefficient, leads to the establishment of an efficient plan with respect to these prices and consequently, optimal with regards to a given criterion of optimality. In other words, in fixing a set of production methods, the criterion of optimality (global objective function) determines (characteristic) prices and, in turn, prices determine the optimality criterion. True, in both cases this correspondence might not be unique, that is, an entire class of criteria might correspond to the same prices. We stress again that the discussion is not about real prices, but only about this function of prices -- that of establishing the level of effectiveness for comparing costs and results.

We have already discussed the conditionality of the concept of an optimal plan. The same also applies to the prices characterizing one. Such prices are optimal only in very specific situations. Incidentally, these properties have often troubled some economists. For example, it sometimes turns out that the optimal price of something, for example, coal, turns out to be zero if it is available in abundance for a given period. However, everyone knows that coal is a valuable product. This leads to the conclusion that prices in an optimal plan do not reflect reality. To some extent this has also troubled optimization specialists. As prices in an optimal plan become more sensitive, then very small changes in conditions, for example, initial information, lead to corresponding changes in prices. However, real prices cannot continuously change, they should be sufficiently stable.



These problems are cleared up to a large extent if a dynamic multiperiod model, rather than a static model is used. Although it can be formally described as a linear programming model, an economic model has fundamentally different possibilities. In addition to current production methods, it includes long-term decisions such as the creation and use of new productive capital over several years. Instead of a static system, a dynamic model gives rise to a dynamic system of prices, that is, a price forecast for subsequent periods. Because of this, in particular, such a system is also more stable. Even surplus coal, for example, has a somewhat reduced, but not zero valuation, as it can be stored and used in a later period [5,6].

The dynamic formulation eliminates shortcomings in the equilibrium model in which, due to the irreversibility of the production process, mistaken, unbalanced decisions are made which cannot be corrected later. In a dynamic model there is a comparison and selection of decisions simultaneously for the entire plan period. Given the appropriate data they can be balanced and, what is more, optimal.

Of course, there are not a few difficulties here. Such an approach can be made only for a controlled economy, described in a reliable manner and with sufficient information available about standards, resources, demand and production methods, not only for the current, but throughout the entire plan period. As our information about future resources, demand and to an even greater degree technology and its standards is approximate and indeterminate (especially under conditions of rapid technological progress), such plans are realistic only for a comparatively restricted time interval. This makes the selection of optimality criteria an acute problem. In comparing plans it is necessary to include not only output (consumption volume) which is obtained for the plan period, but also the potentials for expanding the economy beyond its limits. There can be two approaches here.

The first is to extend the planning horizon through the use of conditional forecast data and construct a plan for this period, but not be completely guided by it, using it only to make more long term decisions for the main period. In the second approach, the economy's resulting state at the end of the period is evaluated during the formation of optimality criteria and output in the plan period. The optimality criteria are far from obvious here. Independent of its selection, the development plan is an extremal variant and therefore has its corresponding dynamic system of valuations for all types of products and resources. The presence of such valuations, especially those which include the economy's future development, provides the basis for solving problems in the use of direct productive resources and of protecting natural wealth and living conditions for future generations.

At one time there were doubts about the possibility of satisfactorily solving the efficiency problem in a socialist system, as it lacked price formation mechanisms such as markets and stock exchanges [7]. The intensive development of the socialist economies in the USSR and other nations, where planned price formation systems have been successfully used, is evidence to the contrary. Such positions are also refuted, as a number of authors in the West have shown (for example, [8], and others) theoretically, by the concepts of optimal planning and

price formation, which, in accordance with the above arguments show that in principle a socialist economy has immeasurably better and more accurate price formation mechanisms providing a basis for making effective decisions and using resources for the benefit of society in general now and in the future.

In a real economy there are no optimal plans and optimal prices in a precise mathematical sense. We are talking about basic directions for improving plans and prices, and how, on an average, the decisions will be close to optimal. This, incidentally, is one of the most important aspects of research in the theory of optimal planning and price formation. There has been insufficient scientific study of the problems of establishing (stable) prices under conditions of indefinite initial information for plan calculation, and under dynamic conditions.

### 3. Price Formation Mechanisms and the Optimal Plan

As was indicated, specific, given prices used to calculate the efficiency of production methods in practice determine the optimality criterion (or class of criteria) for the economy's development. In using them to calculate economic efficiency they make clear what is "better" and what is "worse". The more importance is given to calculations of economic efficiency, the greater the role of prices in the formation of global objectives for economic development. From this perspective it is useful to analyze how global optimality criteria correspond to various known price formation schemes.\*

1. Prices proportional to live labor outlays (the so-called value scheme). We will examine this and subsequent schemes within the framework of intersectorial balance models. The formula for calculating the price of a product,  $i$ , can be written as,

$$p_i = \sum_j a_{ij} p_j + (1+\rho) w_i,$$

where  $a_{ij}$  -- outlays for product  $j$ , per unit of product  $i$ ;  $w_i$  -- wages per unit of product  $i$ ;  $\rho$  -- a normed charge on wages (surplus value norm). It is easy to prove that prices defined by this formula are dual valuations of, say, the following optimization problem

$$x(I-A) - \lambda c \geq 0, \quad xw \leq W, \quad \lambda \rightarrow \max, \quad (1)$$

where,  $A = \|a_{ij}\|$   $x$  -- the row vector of production volume;  $c$  -- final product structure row vector;  $w$  -- unit wages column vector;  $W$  -- total wages fund;  $\lambda$  -- final product volume.

The dual valuations are normed so that the valuation of wages in the inequality  $xw \leq W$ , is equal to  $1 + \rho$ . We note that such modeling of various price formation schemes is used in V. D. Belkin [9].

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\*We are not returning here to the economic equilibrium model examined in Section 1.

2. Prices proportional to prime cost (the so-called average prime cost scheme). Within the framework of an intersectorial balance, the price of product  $i$  is defined as

$$p_i = (1 + \rho) \left( \sum_j a_{ij} p_j + w_i \right),$$

where  $\rho$  is a profitability norm.

It isn't difficult to see that prices calculated using average prime cost are dual valuations of the optimization problem

$$x(I - A(1 + \rho)) - \bar{\lambda}c \geq 0, \quad xw(1 + \rho) \leq W, \quad \lambda \rightarrow \max \quad (2)$$

In this scheme, as in the preceding one, the single norm  $\rho$  can, naturally, be replaced by a differentiated norm. Fixed capital in both schemes is calculated through depreciation deductions included in the calculation of the coefficients  $a_{ij}$  for capital creating sectors delivering the corresponding outlay elements.

We note that the optimization problems of both schemes are very similar to each other with regard to economic content. The difference consists in the method of calculating the share of final product going to accumulation. In the value scheme this share is distinguished directly in the final product and its magnitude expressed by the coefficient  $\rho$ . In determining the primal and dual solutions to problem (1) we have

$$\bar{\rho} \bar{\lambda} c = W(1 + \rho),$$

where  $\bar{\lambda}$  -- the maximum value of the objective function.

Of the total of  $\bar{\lambda}c$ ,  $\bar{\lambda}c\rho/(1 + \rho)$  goes for accumulation. In problem (2) for the average prime cost scheme,  $\bar{\lambda}c$  is completely allocated to final consumption, while output going for accumulation is calculated as a percentage of production methods, depending upon the use of such methods, that is, it is equal to  $x\rho A$ .

3. Production prices. Within the framework of an intersectorial balance, the production price formula is as follows:

$$p_i = \sum_j a_{ij} p_j + w_i + \rho \sum_j b_{ij} p_j,$$

where  $b_{ij}$  -- a coefficient showing the size of the output  $j$ , going into the creation of capital stock involved in the production of a unit of output  $i$ ;  $\rho$  -- profit norm.

A comparatively short analysis which, for brevity's sake is not given, shows that production prices are dual valuations for the problem of J. von Neumann which consists in determining the maximum growth rate for a closed economy. In such a dynamic intersectorial balance model, where closure is more simple, through the inclusion of the "household" sector, the "product" of which is labor resources supplied to all other sectors, and outlays are final consumption, the von Neumann growth rate is expressed as:

$$\alpha = \max_{(x, x')} \min_i \frac{x'_i}{x_i},$$

where max obtains for all  $x, x' \geq 0$ , satisfying  $x(I - \tilde{A}) - (x' - x)\tilde{B} = 0$ . Here  $x$  and  $x'$  are product output vectors for contiguous years;  $A$  and  $B$  are expansions of matrices  $\tilde{A}$  and  $\tilde{B}$  through the addition of closing "household" sectors. The profit norm, used in the determination of production prices is equal to the von Neumann growth rate, i. e.,  $\rho = \alpha - 1$ .

In a similar manner, global optimality criteria can also be constructed for other price systems used in evaluating the efficiency of production methods.

#### 4. Economic Efficiency and the Completeness of Accounting for Factors

In Section 1 it was noted that even if understood in the broadest sense, the products consumed by people include things difficult to include in economic circulation for purely technical reasons. It is therefore completely understandable that the overall efficiency of measures cannot be reduced to economic factors, as there are always factors which must be included for which it is impossible or inadvisable to give an economic evaluation. However, it is economic efficiency that provides a solid objective base for decision making which is correct from the perspective of society in general. Therefore, the greater the number of factors encompassed by economic methods, the more objective and well based will be the decisions made.

The theory of optimal planning and the wide range of models and methods it uses have opened up a fundamentally new approach to the economic calculation of various factors. As is known, in an optimal planning model each factor influencing the set of possible plans receives a specific numerical estimate. This is the foundation for existing methods for the economic valuation of capital stocks, natural resources, services, transportation rates, time factors, location, etc, and correspondingly for working out a unified logically structured theory for the economic valuation of factors.

One of this article's authors has, in the press and at various conferences, repeatedly spoken out in defense of the scientifically based economic valuation of productive capital, capital investments, land and water resources, transportation services and the time factor [10]. A number of other economists have also made these points. At present some of the proposals are being practically introduced in one form or another. However, this is still a long way from an adequately complete and methodologically unified economic calculation of productive factors. The problem is not only the lack of an elaborated and approved methodology. Economic efficiency calculations will only improve the actual economic standards of production when their role and, in general, the role of economic efficiency in decision making improves markedly compared to the present situation. There is a mutual feedback here. The improved scientific basis of economic efficiency will lead to increased confidence in them on the part of economic agents. Concurrently, the intensified role of economic calculations will also increase the attention paid to their quality.

Solutions to these problems often cause many difficulties. A resource is not properly evaluated and it is essential to find other forms of cost accounting



which will do this properly. One of the most pressing and complex problems in this area is that of assuring the most rational consumption and the best protection of natural resources in a given territory used by extractive industry enterprises.

In a controlled economy it is possible to make price formation decisions for society and immediately introduce them into the cost accounting system. For example, for a number of years prior to the introduction of payment for capital, capital outlays were taken into consideration during planning by comparing the payback period for alternatives. In economic analysis and planning some consideration is also now given to the evaluation of land and mineral resources. Optimizing calculations for sector location are made using the accepted methodology; transportation costs are calculated for an optimal arrangement (for incremental current and capital costs) although the existing rates are set in a different manner. Generally speaking, in the future, railroad transportation rates could be based on the level of incremental costs. True, railroad transportation might then become unprofitable, but its losses would be more than compensated by income growth in other sectors, particularly raw materials ones. Such measures can be implemented in a unified, controlled economy interested in the final overall national economic effect. On the other hand they would be unrealizable under conditions of private ownership of the means of production.

Approaches to including the complete effect in efficiency calculations are systematically examined in [11]. The same type of optimal decisions can also be made in the regulation of consumer demand. The formulation of a social utility function as the sum of individual utilities (as is done in the Arrow-Debreu model) can hardly be considered proper from a social perspective. In the demand structure public preferences can substantially differ from individual ones. In a controlled economy such corrections in planning and prices are completely possible. An example of this is the USSR's systematic price reductions and low profitability (and sometimes losses) for children's goods and the housing sector. Of course, in determining and making these shifts it is essential to optimize decisions and coordinate them with cost accounting and material interests.

The central planning and price setting mechanism does not exhaust the problem of optimizing control over the economy. This is particularly true in view of the indeterminacy of information, individual consumption decisions and other factors. The basic planned control of the economy is to varying degrees supplemented by unregulated elementary economic acts and the effects of economic levers upon them. This also includes the possibility of correcting prices with the help of feedback and supply and demand relationships, something which is repeatedly done in practice. However, problems in the use of this mechanism in combination with planned control and planned (optimal) price setting have not been theoretically worked out to a sufficient degree, especially their specific implementation. One thing is certain: central planning and planned price formation are the most important means of controlling a socialist economy. They are appropriate to its nature. Unplanned decisions and economic means (feedback) play an important, but subordinate auxiliary role.

These and other problems relating to the prospects and problems of optimal planning and price formation have already been posed [12], but require further discussion and refinement.

At present it is advisable to have definite limits upon the strengthened role of cost accounting and enterprises' rights. This is because imperfections in price formation systematically give rise to situations (especially during the production of new equipment) when economic efficiency (or profit) do not coincide with, but are directly opposed to the actual national economic effect of production. The existing price formation system insufficiently stimulates the production and use of new output, equipment, etc. This is because it does not include a special factor -- the very creation and introduction of innovations as a specific type of output which, together with completely new (material) products, makes a substantial contribution to the social product. (For more detail about this, see the following section). In actuality it often turns out that during the first period for the output of new equipment, the price at which its production is economically efficient and advantageous is too high for the customer, for whom the use of such equipment is unprofitable. If the price is reduced to benefit the customer, then it becomes unprofitable for the producer, although its production is quite justifiable for society as a whole.

## 5. Prices and Innovations

In order to show how prices for innovations arise and how they should be included in economic efficiency calculations, we examine an optimal production planning problem in which there is a set of feasible innovations. Innovation is an action which uses definite resources (labor, materials, equipment) and which results in new production methods, technology, types of product, etc.

Outlays involved with an innovation,  $k$ , are formally written as a vector

$d^{(k)} \in R^{s+l}$ , while the new production processes obtained as a result of its realization form a closed, convex cone  $Z^{(k)} \subset R^{s+l}$ . There is a finite number  $N$  of innovations, that is,  $k = 1, \dots, N$ . The set of existing production methods is a closed convex cone  $Z^{(0)} \subset R^{s+l}$ . All resources (products, stocks, etc.) are divided into two types: common to the system, the quantity of which is equal to  $l$  and those which apply only to a given producer, the number of which is equal to  $s$ .

The set  $\Delta$  of feasible plans for the realization of innovations, if  $R$  resources are allocated for this purpose is defined as

$$\Delta = \{\delta \in R_+^N \mid \delta D \leq R, \delta = 0, 1\},$$

where  $\delta$  -- a Boolean vector;  $\delta_k = 1$  means that the innovation is accepted introduction;  $\delta_k = 0$ , that it is not so accepted;  $D$  is a matrix, the rows of which are outlays for innovations.

The set of production possibilities, upon fixing the plan for the realization of innovations  $\delta$

$$Y(\delta) = \left\{ y \in R^l \mid (y', y) \in \left( R - \delta D + Z^{(0)} + \sum_{k \in N(\delta)} Z^{(k)}, y' \geq 0 \right) \right\},$$

where  $N(\delta) = \{k \mid \delta_k = 1\}$ .

The collection of production possibility sets:  $Y = \bigcup_{\delta \in \Delta} Y(\delta)$

The problem of optimal production planning has now been reduced to the maximization of a concave function  $u$ , on  $Y$ .

Often the objective function is a collection of sets. For each  $\delta \in \Delta$  we obtain a convex programming problem  $\{\max u(y) \mid y \in Y(\delta)\}$ . The solution  $(\bar{y}, \bar{\delta})$  to the general problem can be found by partition, solving the convex problem for each  $\delta$ .

We designate by  $p \in R^{s+l}$  the dual valuations corresponding to the solution  $\bar{y}$  of the maximization problem  $u$  on the set  $Y(\bar{\delta})$ . These valuations cannot serve as prices to calculate efficiency as they do not include outlays for the realization of innovations. New production methods are assumed to be efficient using valuations  $p$  if these valuations are equal to existing ones. Consequently, when outlays for the implementation of innovations are included they are always inefficient. The valuations  $p$  are suitable as prices for consumers of output from the producer described by the function  $u$ .

Instead of problems in the maximization of  $u$  in the set  $Y(\bar{\delta})$  one could examine the problem of maximizing  $u$  in the set

$$\bar{Y}(\delta) = \left\{ (y', y) \in (R + Z^{(0)}) + \sum_{k \in N(\delta)} (d^{(k)} + Z^{(k)}), y' \geq 0 \right\},$$

where outlays for the realization of innovations are directly taken into consideration. This is also a convex programming problem and its solution is characterized by the dual valuations  $\tilde{p}$ , which also best reflect the interests of consumers ( $\nabla u(\bar{y}) = \tilde{p}$ ). However, it isn't difficult to give examples where the sought for solution  $\bar{y}$  cannot be obtained as a solution to the maximization of  $u$  in  $Y(\bar{\delta})$ . It is also easy to show that in general there do not exist prices  $p = (p_1, \dots, p_l)$ , which would result in a solution  $(\bar{y}, \bar{\delta})$  which is efficient and simultaneously yield the relationship  $\nabla u(\bar{y}) = p$ , i.e. would be advantageous to the consumer.

The non-existence of prices coordinating the economic interests of producers and consumers is due to the analysis not taking all factors into consideration. This particularly applies to the production of innovations as such. In order to introduce this into the analysis, we expand the set of production possibilities, including, as the results of productive activity, volume (or scale) indicators of the introduction of innovations, that is, special types of products  $s + l + 1, \dots, s + l + N$ .

We examine the cone  $Z^{(k)}$  of production methods created by the innovation,  $k$ . The methods included in  $Z^{(k)}$ , are assigned a norm  $f_k$ , for example  $f_k$  — a linear function defined on  $Z^{(k)}$  such that  $f_k(z) > 0$ , for  $z \neq 0$ . The expanded (or modernized) set of production possibilities will be the set  $Y = \bigcup_{\delta \in \Delta} Y(\delta) \times F(\delta)$

$$\begin{aligned} F(\delta) &= \{f \in R_+^N \mid f_k = f_k(z^{(k)}), \quad k \in N(\delta), \\ p, \left( z^{(0)} + \sum_{k \in N(\delta)} z^{(k)} + R - \delta D \right) &\geq 0, \quad z^{(0)} \in Z^{(0)}, \\ z^{(k)} &\in Z^{(k)}, \quad f_k = 0, \quad k \in N(\delta) \}. \end{aligned}$$

Here  $p_{r_s}(z)$  is the designation for the first  $s$  coordinates of vector  $z$ .

The following convex programming problem  $(\pi)$  is formulated for  $\bar{Y}$  and the fixed vector  $\pi \in R_+^N$  find  $(\delta, y)$ , given the constraints

$$\delta \geq 0, \quad \delta B \leq R,$$

$$\left( \sum_{k=0}^N z^{(k)} + R - \delta D \right) \geq 0, \quad z^{(k)} \in N^{(k)}, \quad k=0, 1, \dots, N,$$

$$y = p_{r_s} \left( \sum_{k=0}^N z^{(k)} + R - \delta D \right),$$

$$u(y) + \sum_{k=0}^N \pi_k f_k(z^{(k)}) \rightarrow \max.$$

The following holds (for more detail, see [13]).

Let  $(\bar{\delta}, \bar{y})$  be the solution to the optimal production planning problem  $\{u(y) \rightarrow \max | y \in Y\}$ . Find the vector  $\pi \in R_+^N$  so that there are solutions to the problem  $(\bar{\pi})$  congruent with  $(\bar{\delta}, \bar{y})$ . This implies the existence of a system of optimal valuations  $(\bar{p}, \bar{\pi})$ , characterizing the solution  $(\bar{\delta}, \bar{y})$ . Here  $\bar{p}$  are valuations relating to the products  $s+1, \dots, s+l$ , while  $\bar{\pi}$  are the valuations of the innovations  $s+1, \dots, s+l+N$ , which are obtained in the solution of the problems  $(\bar{\pi})$ . Thus, if we take  $(\bar{p}, \bar{\pi})$  as prices, they will make all production methods included in the solution  $(\bar{\delta}, \bar{y})$  efficient, that is,  $(\bar{\delta}, \bar{y})$  will be economically advantageous to the producer and the prices  $\bar{p}$  will simultaneously be advantageous to the consumer.

It should be noted that the existence, for a feasible plan  $(\delta, y)$  of dual valuations with the appropriate properties does not entail the optimality of  $(\delta, y)$ , as is observed in convex programming problems.

Thus, the economic interests of producer and consumer coincide with a price which includes prices of special products -- realized innovations, measuring the volumes of their production application. There is production of product  $y$ , used by a consumer, the interests of whom are described by a function  $u$ , while the innovation is used in amounts  $f$ . A special organ responsible for scientific and technical progress consumes (pays for) them. The sum  $\pi f$ , obtained by the producer for a realized innovation, is a payment for a contribution to improving the country's general scientific-technical level. This contribution should not be made by a specific producer of a new product or technology, but by the state in general.

There can be different specific methods and mechanisms for organizing such payments. We only stress the fundamental facets of the problem here. We note that payments for innovations made after their realization should not be mixed up with the financing of outlays for new equipment prior to this realization. Financing has no direct linkage with price formation for new products, while payment for introduced innovations are its organic component.



This model involving new equipment and the conclusion regarding the necessity of special payments and prices for innovations do not contradict the general scheme for optimal planning. The same conclusion can be obtained on the basis of a dynamic optimal planning model. In analyzing the possibility of introducing additional methods at a given time (discrete or continuous, henceforth we have the latter in mind) one can incorrectly evaluate the efficiency of such an innovation if one considers a limited period, slows it down or reduces the volume. However, the calculations can be corrected through a study of the post-plan period. A positive effect from the spread of an innovation in this period will compensate for outlays made in the base interval. The dynamic system of valuations will correctly determine the rational volume and price of new output.

However, in view of the difficulties in a concrete evaluation of potential spheres for an innovation's dissemination, another path is possible. After examining only the base period, components are added to the optimality criterion. These depend upon the system's output state and include the condition and level of fixed capital and scientific-technical potential. The latter, in particular, can be characterized by various valuations of realized innovations (the degree of introduction, spread and the potential consequences). During plan formation these potentials will have an effect upon the selection of innovations, the time and pace of their spread and the setting of correct prices for their resulting products. Just as is the case with regard to capital investments, outlays required for the implementation, mastery and spread of innovations are apportioned to all future output, not just initial output. Naturally, there will also be special financing of innovations, in particular, the allocation of resources to compensate producers for higher estimated prices (and costs) during the first period. This could create economically favorable conditions for the realization of innovations. These considerations are developed in somewhat more detail in [14].

Increases in production efficiency with the help of improved price formation are possible only through the implementation of a comprehensive system of measures covering a large circle of problems (including the necessary changes in managers' psychology).

Prices perform redistributive functions in the national economy. It is also important to coordinate them with other tools for distributing and redistributing material, financial and other resources. For example, the setting of low prices for textbooks (free for secondary school pupils) should be coordinated with mechanisms for their distribution. As wholesale and retail prices are not (and should not), in a socialist economy, be prices for equalizing supply and demand, these latter are balanced primarily with the help of planning mechanisms and direct methods of control. These problems have still not been sufficiently developed in a scientific basis.

In general, the following conclusion can be drawn about the contribution of mathematical economics to the theory of price formation. Models of optimal planning and efficient production have become important tools for learning about the properties of prices and the potentials for their application as a measure of economic efficiency. Models of economic equilibrium are an adequate mathematical apparatus for studying the process of balancing supply and demand with the help

of prices within the framework of the strict assumptions of perfect competition. The study of contemporary mechanisms for balancing supply and demand, in which price does not play a minor role, is still essentially in the initial stages of development.

#### BIBLIOGRAPHY

1. Arrow, K., Debreu, G., "Existence of an Equilibrium for a Competitive Economy," *ECONOMETRICA*, 1954, Vol 22, No 3.
2. Arrow, K., Block, H., Hurwicz, L., "On the Stability of the Competitive Economy," *ECONOMETRICA*, 1959, Vol 27, No 1.
3. Schwartz, J. T., "Lectures on the Mathematical Method in Analytical Economics," N.Y., 1961.
4. Akilov, G. P., Kantorovich, L. V., Rubinshteyn, G. Sh., "Extremal States and Extremal Control," *VEST. LGU. SER. MATEM. NAUK.*, 1961, No 7.
5. Kantorovich, L. V., "A Dynamic Model of Optimal Planning," In: "Planirovaniye i ekonomiko-matematicheskiye metody" [Planning and Mathematical Economics], Moscow, Nauka, 1964.
6. Kantorovich, L. V., Makarov, V. L., "Optimal Models of Long Term Planning," In: "Primeneniye matematiki v ekonomicheskikh issledovaniyakh," [The use of Mathematics in Economic Research], Vol 3, Moscow, Mysl' 1965.
7. von Mises, L. "Economic Calculation in the Socialist Commonwealth," In *Collectivist Planning*, Routledge and Kegan, London, 1935.
8. Wilczinski, J., "The Economics of Socialism," London, 1974.
9. Belkin, V. D., "Tseny yedynogo urovnya i ekonomicheskkiye izmereniya na ikh osnove" [Single Level Prices and Economic Measurements Based on Them], Moscow, Ekonomizdat, 1963.
10. Kantorovich, L. V., "The Best Use of Economic Resources," trans. P. F. Knightsfield, Cambridge, Harvard Univ. Press, 1965.
11. Kantorovich, L. V., et. al., "On Evaluating Capital Outlay Efficiency," *EKONOMIKA I MATEM. METODY*, 1970, Vol 6, Iss. 6.
12. Kantorovich, L. V., Gorstko, A. B., "Optimal'nyye resheniya v ekonomike" [Optimal Decisions in Economics], Moscow, Nauka, 1972.
13. Makarov, V. L., "Economic Equilibrium Models with Innovations," In: *Optimizatsiya*, Iss 18, Novosibirsk IM SO AN SSSR, 1976.
14. Kantorovich, L. V., "Economic Problems of Scientific-Technical Progress," *EKONOMIKA I MATEM. METODY*, 1974, Vol 10, Iss. 3.

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## ECONOMIC MODELING AND COMPUTER TECHNOLOGY APPLICATION

### INCREASED USE OF COMPUTERS IN PLANNING UNDER WAY

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[Article by Deputy Chairman of the RSFSR State Planning Committee N. Zenchenko: "The Improvement of the Drafting of the Plan of Social Development With the Use of the Automated System of Planning Calculations"]

[Text] At the stage of mature socialism the group of tasks, which govern the activity of the system of management and planning, has expanded significantly. At the June (1983) CPSU Central Committee Plenum Yu. V. Andropov noted the need for the assurance of a close connection of economic and social policy, since "the improvement of the living conditions of people is the key goal of our efforts. We must learn, when drawing up our economic plans, to thoroughly take into account and reflect in them the most important factors of the development of society--social, national, demographic."<sup>1</sup> These requirements also found their development at the December (1983) CPSU Central Committee Plenum. In the speech of Yu. V. Andropov at the plenum it was stressed: "All our efforts in the economy in the end are aimed at the increase of the standard of living of the people. This is the main sociopolitical goal of our plans."<sup>2</sup>

The tasks of the increase of the well-being and cultural level of the Soviet people act simultaneously as the aims and the ultimate generalizing results of the increase of social production, and also as a prerequisite of the further development of the economy, science and technology. The importance of the comprehensive plan of social development and the increase of the standard of living is increasing accordingly. Therefore the efforts of planning and scientific organizations are aimed at the search for means of the improvement of the methodology and practice of social planning and the extensive use when drafting social plans of mathematical economic methods and electronic computer equipment.

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1. "Materialy Plenuma Tsentral'nogo Komiteta KPSS, 14-15 iyunya 1983 goda" [Materials of the CPSU Central Committee Plenum, 14-15 June 1983], Moscow, Politizdat, 1983, p 13.
  2. PRAVDA, 27 December 1983.

## The New Demands on the Formation of the Plan in the Area of Social Development

The formation of the plans on a set of measures in the area of social development is carried out with allowance made for the suggestions which are received from the corresponding enterprises and institutions, ministries and departments, rayons, cities, oblasts, krays and union republics. Here both the sectorial and the territorial breakdowns of the plan are of great importance. Comprehensive planning should govern the activity of organs of management in two directions: through the sector--the subsector--the main administration--the association to the labor collective; through territorial units of a different scale--union and autonomous republics, krays and oblasts, cities, rayons--again to the labor collective, which is the basic economic and social unit of socialist society.

An interconnected, integral system of organizational, economic and moral levers, which increase the interest of managers and workers, scientists and designers in the further increase of the intensification of social production, is envisaged in the decisions of the June (1983) CPSU Central Committee Plenum. To achieve this everywhere means to solve a problem of not only enormous economic, but also political importance, since the more significant the achievements in the economy are, the broader the scope is for the accomplishment of social tasks.

Our country has approached such a historical turning point, when qualitative changes in the productive forces and the corresponding improvement of production relations have become inevitable. This has required the further development of the theory and methodology of socialist planning and the efficient management of social processes on the level of the union republic, ministries and departments, the local soviets of people's deputies.

In the practical work of the organs of management and planning the formula "the increase of the standard of living" was usually reduced to a limited set of indicators of the increase of the income of the population and the production of consumer items. At the June (1983) CPSU Central Committee Plenum it was recognized as incomplete and therefore as not conforming to the new tasks of the building of socialism. This resulted in the posing of a group of questions, which are connected with the development of the methods of social planning, with the system of indicators and standards and with the peculiarities of the sectorial and territorial solution of social problems.

An extensive set of processes of social life: the social, class structure of the population, the conditions and nature of labor and relaxation, the supply of people with material and spiritual goods, marital and family, international relations and so on, constitutes the basis of the social problems of national economic plans under present conditions. The social orientation of the plan finds its reflection in the corresponding change of a number of economic proportions, among which one of the most important is the proportion of the consumption fund and public funds in the national income. Now in connection with the elaboration of the Basic Directions of Economic and Social Development for the 12th Five-Year Plan and the Period to 2000 this question is becoming especially urgent.



During the 11th Five-Year Plan the wage of workers and employees will increase by 16.4 percent, while the public consumption funds will increase by 22 percent. In our opinion, the leading increase of the public funds as compared with the increase of the wage is a natural processes. It is due to the need for the stimulation of demographic processes, the protection of motherhood and childhood and the development of education and culture and to the increase of the size of the population of older ages.

It is advisable to include in the set of measure on social development, along with the traditional indicators, the assignments on such directions which, in essence, have not yet been objects of planning (the conditions and nature of labor, sociodemographic changes, the free time of the population and so forth), as well as the indicators, which reflect the struggle against negative phenomena in the life of society, and the steps, which are being taken against harmful survivals in the consciousness and behavior of people and deviations from the norms of socialist legality and morals.

Along with the solution of social problems for the country as a whole and in the sectors of the national economy the improvement of the territorial aspect of planning in the direction of the determination of the specific nature of the posing and accomplishment of social tasks in the autonomous republics, krays, oblasts and economic regions is beginning to hold a more and more important place. On the one hand, this presumes an accurate system of the recording of the needs of the population of specific regions and, on the other, the improvement of the conditions of their formation (national traditions, the demographic activeness of the population and so on) when formulating the social programs of long-range plans. The question of the equalization of social differences on the territorial level, which was posed at the 26th CPSU Congress, is especially urgent for the RSFSR. The need for social benefits for each of its regions is different, while the task of ensuring an identical standard of living for the republic as a whole is quite complicated.

The individualized approach to the planning of social measures also requires the more thorough consideration of the specific nature of the social development of different types of settlement. At present this aspect of planning is oriented mainly toward the solution of the problems of the convergence of the living conditions of the urban and rural population.

Many plans of social development are still being drawn up at a relatively low scientific level, which is connected with the shortage of sound social norms and standards, which would make it possible to distribute material and financial resources most efficiently over the territory.

As a rule, the limits of capital investments, the increase of the general educational level of the workers, the development of amateur activity, physical culture and sports, the decrease of the sick rate, the turnover of personnel and others are planned "from what has been achieved." A number of indicators, which characterize separately the aspects of the increase of the standard of living, are reflected in different sections of the plans, which makes their analysis difficult.

In our opinion, planning and economic organs and the corresponding scientific organizations should speed up the formation of differentiated socioeconomic

norms and standards, so that it would be possible to use them already when drawing up the draft of the Basic Directions of Economic and Social Development for 1986-1990 and the Period to 1990.

The practice of including social tasks in the national economic plans has shown that the concerted actions of various ministries and departments and the local soviets of people's deputies are required for their fulfillment. Precisely in case of the drafting of the plans by territory and their fulfillment the local soviets most often are faced with the display of departmental interests, especially in case of the comprehensive solution of social problems and the implementation of measures on the development of production, the introduction of new equipment and others. In this connection the fulfillment of the decree of the CPSU Central Committee, which examined the tasks of party organizations in connection with the preparation for and the holding of the elections to the USSR Supreme Soviet, 11th Convocation, is acquiring especially great importance. In the decree it is noted: "The preparation for the elections is called upon to serve as much as possible the accomplishment of the tasks posed by the party of economic and social development, the increase of the role and authority of the soviets and labor collectives, the improvement of the work of state and economic organs, the tightening up of discipline and order and the increase of the initiative of the masses."<sup>3</sup>

#### The Most Important Subsystems of the Automated System of Planning Calculations for the Drafting of the Comprehensive Plan of Social Development

The increasing amount of information, which is used when preparing the plan of social development, the need for the drafting of several versions of the plan and the more and more extensive use of the materials of sociological studies are complicating significantly the work of planning organs. The introduction of mathematical economic methods and modern equipment for the transmission, processing and storage of economic information and the development of automated systems of planning and management are one of the means of solving this problem.

The use of the automated system of planning calculations when drafting the plan on a set of measures in the area of social development is the process of the integration of the methodology and organization of national economic planning with mathematical economic methods and modern means of the processing of information. Here the methodology of planning is being improved on the basis of the use of such methods (economic modeling, optimization methods, intersectorial balances and so forth), the use of which previously in practice was not possible.

The work on the designing and introduction of the subsystems of the automated system of planning calculations, which are connected with the formation of the comprehensive plan in the area of social development, was begun later than the introduction of the subsystems for the planning of the production sectors of the national economy. Of the 878 problems, which were adopted in use in 1980 in the RSFSR State Planning Committee, the sections of the plan of social development on the subsystems: "Labor and Personnel," "Health Care," "The

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3. PRAVDA, 20 December 1983.

Standard of Living of the People" and "The Production Cost and the Profit," accounted for only 159 (18 percent). In the time, which has passed since 1980, their number has increased to 320. Moreover, more than 300 problems, which are connected with the drawing up of the plan on the set of measures in the area of social development, are being worked on in the departments of housing construction and municipal services, commodity resources and the commodity turnover, consumer services, nature conservation and others.

The subsystem "Labor and Personnel," which is being elaborated and is already being used in part, envisages the drawing up on the set dates of drafts of the long-range and current plans on labor and personnel: the determination of the scientifically sound needs for manpower resources and their structure; the most complete accounting of manpower resources, their efficient distribution and use; the assurance of the steady increase of labor productivity; the achievement of a balance of the needs of the national economy for manpower resources with their availability from a sectorial, territorial and occupational skills viewpoint; the monitoring of the fulfillment of the plan on labor and personnel. The designing and gradual introduction of the subsystem are carried out in two stages: the making on computer of calculations, which make it possible to obtain a draft of the plan in a computer version, and the use of mathematical economic methods in the practice of planning. It envisages: the improvement of the method of calculating the plans on labor, which ensures the output of standardized forms of the plan by means of computer; the elaboration of standard algorithms and computer programs for the calculation of the indicators on labor; the formation of standardized output documents by blocks and for the subsystem as a whole; the assurance of multivariant calculations of the draft of the plan. It is elaborated as a part of three functional blocks: "Manpower Resources," "Labor" and "Personnel." In particular, the block "Labor" includes sets of calculations of the level and growth rate of labor productivity, the average wage in industry, construction and agriculture, the limits of the number of workers and employees, the average wage and the wage fund. Its problems are united into a single set through the consolidated indicators on labor for the RSFSR: the number of people employed, the wage fund and the growth rate of labor productivity. Within the block these calculations for the RSFSR are made with a breakdown by economic regions, autonomous republics, krais and oblasts, the number of workers and employees in Moscow and Leningrad is determined with a breakdown by ministries and departments and the sectors of the national economy.

In the subsystem great importance is being attached to the calculations on the problem "The Monitoring of the Progress of the Fulfillment of the Five-Year and Annual Plans." By means of computer analytical tables, which are necessary for the making of decisions on the elimination of shortcomings during the fulfillment of the plans, are compiled and the changes in them are taken into account; calculations of the expected fulfillment of the plan are made.

Calculations were also made in accordance with the processing of the data of an inventory of the sources of discharges of harmful substances into water bodies and the atmosphere. As a result information was obtained from 20 ministries and departments on the autonomous republics, krais, oblasts and economic regions, 300 cities, 40 sectors of the national economy and more than 100 basins of rivers, seas and lakes.

A large amount of computing work is being performed with respect to the subsystems of housing and municipal services, trade and consumer services, which interact with the subsystems of the management of social planning during the drafting of the plan and the checking of its fulfillment. The formation of the basic indicators of the section of the comprehensive plan of the social development of the republic at the stages of the formulation of the drafts of the five-year and annual plans and their approval is the ultimate goal of the calculations.

#### The Problems of the Automated Accomplishment of the Planning Tasks in the Dialogue Mode

Among the problems of the efficient use of electronic computer equipment in planning and management the question of the dialogue of man with the computer holds a significant place. The experiments in this direction are being conducted quite successfully. The practical experience of the use of computers in the RSFSR State Planning Committee, where small computers, which are installed directly at the workplaces, have received extensive dissemination, merits attention. In the total volume of tasks, which were adopted in use, the tasks, which are accomplished on small computers, in 1980 came to 50 percent, while by 1983 their proportion had increased to 75 percent with an overall increase of the number of tasks being accomplished during this time by twofold. Planning workers rate highly the possibility of the efficient use of these computers in the dialogue mode.

During the accomplishment of the planning tasks a large quantity of source materials: reports, standards, calculations of the expected fulfillment and so on, is accumulated in the memory of the computer. For the assurance of their optimum use arrays of data, which ensure the obtaining of various information during the drafting of the plans and the monitoring of their fulfillment, have been formed in the departments.

At the initial stage of this process work is performed on the choice of the most frequently used information for the preparation of reference materials for the entire set as a whole in the area of social development. Particular attention is directed to the forecasting of the progress of the fulfillment of the plan by ministries and departments. Data on the necessary rate of development of production and the achievement of the qualitative indicators for the remaining time of the year are also stored in the reference arrays.

Data on the fulfillment of the plans of capital construction and the placement into operation of enterprises and institutions of the nonproduction sphere: housing, schools and preschool institutions, vocational and technical schools, institutions of culture, health care and social security, have been fed into the memory of the computer. These data are available for 1983 and the first, second and third quarters of 1983. Information on the development of the network of these institutions for the RSFSR over the last 15 years has also been incorporated.

It is advisable to organize the output of reference data, in our opinion, according to the dialogue principle. Only in this case will it be effective in the operational management of the implementation of the plan. The display of



the data on the progress of the fulfillment of the plan assists the discussion of specific questions with representatives of the ministries, departments and executive committees of the local soviets of people's deputies. Frequently their joint examination makes it possible to make immediately the proper decision. As needed these materials can be immediately printed.

The completion of the work on the automation of planning calculations (tasks) on the production cost and profit and other financial indicators, their gradual combination into sets of tasks and the increase of the composition and volumes of the local data arrays created the opportunity to organize a file on the basis of the principles of automated data banks. This is making it possible to ensure collective access to the unified (integrated) database, to increase the efficiency and reliability of the information being put out, as well as to increase substantially the opportunities for the drawing up of drafts of the plans and the monitoring of their fulfillment.

The "Bank" automated system for information support should be a set of the methods and means, which ensure the formation and management of the base of data, which are necessary and adequate for the preparation of the drafts of planning forms for the drafts of plans and analytical tables, the retrieval and output of regulated information and data according to random inquiries, the automated designing and correction of the programs of calculations. The first section of the system ensures the accomplishment of the functions in question for the blocks "Industry," "Construction and Installation Work" and "Consumer Services" of the subsystem "The Production Cost and the Profit."

The means of the automated designing and correction of the programs of the calculations of regulated information and the information according to random inquiries enable planning workers, who do not have special training in the area of programming on minicomputers, to develop in the dialogue mode the necessary algorithms of the calculations with the subsequent automatic formation of the programs.

The special software of the "Bank" system is divided into basic and auxiliary software. Its basic software should accomplish the functions which are connected with the direct meeting of the information needs of the planning workers of the department. Among them are: the input, preliminary processing and analysis of the primary source information, the formation and correction of the database, the analysis of the inquiry and the retrieval of information in the system, the processing of the found information in conformity with the inquiry, the display and printout of the data, the organization of interaction with the user.

The auxiliary software carries out the implementation of individual procedures, which ensure the fulfillment of the basic functions (the input and management of the dictionary of indicators, the formation of arrays, which are designed for the fulfillment of the procedures of the automatic coding-decoding of messages, the storage and output of information and the functioning of the system).

Small computers are most suited for the efficient processing of information in the dialogue mode. Their use does not require lengthy special training,

speeds up significantly the analysis of data and makes it possible to carry it out in a decentralized manner, down to the individual workplace. The cost of an hour of work on the Iskra-226 minicomputer does not exceed 5 rubles, the total area of its arrangement comes to 18 m<sup>2</sup>, which is one-fifth as great both in area and in the cost of an hour of work as, for example, the operation of the YeS-1020 computer.

The use of computer equipment in the dialogue mode directly at the workplace makes it possible to use mathematical economic methods effectively for the processing of information and the making of planning calculations. Thereby the drafting of the plans of economic and social development is sped up significantly, their quality increases and the monitoring of fulfillment is tightened up.

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CONCEPTUAL DIFFERENCES IN MODELING DEPLORED

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[Yulo Kaevats and Aado Kespayk, Department of Philosophy and Institute of History, Estonian SSR Academy of Sciences: "The Concept of Model in the Methodology of Science"]

[Text] In recent years, an abatement of "extensive" interests has been observed on the part of philosophers in regard to methodological problems of modeling, which is borne out by a considerable reduction in the number of works on this topic. This phenomenon can be explained by a change in mode, but only partially. It seems to us that many methodologists-modelists consider that part of their activity to be basically exhausted which applies to particular sciences. Nonetheless many methodological problems--including the basic ones--have not yet been satisfactorily solved.

The differences of the investigators are shown in their views on classification of models, their gnosiological functions and the place and role of models in the development of science. At first glance this is quite strange, inasmuch as in the matter of definition of concept of model the authors show no difference in principle. But a more detailed examination of the question discloses that different interpretations are to be found behind similar definitions.

In order to be actually able to compare the views of the different authors, it is necessary to ascertain what they actually have in mind when using the term "model." Only then will it be possible to validly select one of the existing conceptions of the model as a working one and to be confident that it is based not on a combination of various views of different authors but on a logically consistent system of views. A criterion of selection could in our view be the conceptual possibilities of different points of view which are disclosed only in the course of their functioning in the general system of scientific-methodological knowledge. On analyzing the conception of the term "model" by different authors, it is possible to correctly appraise their contribution to a philosophical investigation of the method of modeling and on selecting a single conception as a "common denominator," to achieve a positive synthesis of all achievements in this field.

Our aim in this article is to compare methodological bases and to correlate the conceptual possibilities of the basic interpretations of the term "model" existing in the Soviet gnosiological literature as well as to present our arguments in favor of the so-called situational approach.

At the present time, the definition of model first proposed by L.O. Valt (1, p 8)" as an objectively existing or described object whose study provides information about another object" is for all practical purposes generally accepted (with some modifications).

The definition of a model as replacing the original of an object (system) is always connected with the need of an analogy or similarity of model and original according to some characteristics, which is either considered as the principal condition of modeling or is included as a basic feature of a model in its definition. Modeling is a process which begins with the start or building of a model and ends with transfer of the obtained knowledge from the model to the original.

The presented definitions (of a rather high order of abstraction) exhaust in basic features the generally recognized content of the terms model and modeling. Differences in the views of investigators already begin in the classification of models, especially in regard to modeling and the non-model nature of different formalisms (frequently called logico-mathematical or symbolic models. A complex and rather frequently discussed problem is, for example, differentiation of theory and model.

True, within the scope of the concept of "model" it is possible to isolate an invariant nucleus, which includes: (1) formations called material models and (2) models-representations ideal model images. But these material and ideal formations constitute only a part of the objects with claims to being model in character. The noted divergences first of all reflect differences in the approaches of methodologists to an understanding of the examined concepts. Two approaches may be selected. The first of these may be conditionally called qualitative. Methodologists-modelists of the second approach proceed from the concept of model and attempt to infuse it with a content corresponding to the use of this term in different sciences. The idea is produced of a model serving as an approximate copy or image of the original. All that remains is to determine the character and degree of similarity of the model and the original. It would be timely to differentiate the "broad" and "narrow" variants of the qualitative approach. Representatives of the first speak rather broadly of the requirement of similarity. For example, the prominent Soviet mathematician N.N. Moiseyev (2, p 98) writes that the term "model" "...will

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1. O.V. Lapshin and O.M. Sitsivitsa first drew attention to the two approaches to the concept of model. In an article "Heuristic Functions of a Model"(FILOSOFSKIYE NAUKI, No 3, 1955, pp 45-50) these approaches were respectively characterized as acknowledging the basic feature of the model to be its analogy with the original and as stressing its function in cognition.



be lent the extremely broad meaning of a relative truth reflecting with a certain accuracy these or those aspects of reality found in the symbols of any language.<sup>2</sup> It is clear that the adherents of such a definition include in the concept "model" all the basic categories of the methodology of science relating to forms of knowledge.

V.A. Shtoff should be considered the chief representative of the "narrow" variant. It is characteristic that he includes in his definition of model (3, p 19) a feature which "reflects or reproduces the object of research." This is first of all a structural, spatial description. Logico-mathematical models (that is, formalisms in the role of models) are possible from his point of view only in logic and mathematics but not in the empirical sciences. Models are not:

- (1) a theory, even an insufficiently worked out one;
- (2) any quantitative theory, mathematical scheme, mathematical description (often encountered in economics, biology and psychology);
- (3) a formal or formalized system (especially in logic) (3, pp 10-12).

"A model is not a theory, while that which is described in the given theory is a distinctive subject of the given theory," V.A. Shtoff sums up in his analysis (3, p 9).

The "narrow variant of the qualitative approach is also legitimate in the interpretation of a model in the social sciences. Ye.V. Karakozova (4, p 90) writes that a mental model in sociology by virtue of the specific character of the subjects of investigation (in most cases) does not possess a visual-sensitive expression but is formulated as a certain ideal construction or scheme. A "model-idealization" is the initial factor of the investigation, a means of cognition, a concentrated expression of the theory of a certain level, a means of interpretation of a formalized theory and an intermediary link between theory and practice." This description may be accepted as the result of the concept of the model developed by V.A. Shtoff.

The other approach may be called situational. Here the point of departure is the second member of the pair "model--modeling," that is, it is believed that a model does not exist outside of a modeling situation.

At the present time, the situational concept of the model is still inadequately developed. There exist only a few articles on this subject and also isolated statements in works that are not especially devoted to a definition of a concept of the model or even those essentially developing a concept of another kind.

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2. Although this definition was taken from a work that did not specially deal with the gnosiology of modeling, in my opinion, it well illustrates the "broad" qualitative approach to the concept of model.

The situational approach is expressed by some others first of all in a characterization of symbolic models: "The symbolic system becomes a model only in the case where it is the subject of investigation if within its scope and its means problems are solved whose sense and meaning lie outside the scope of the given symbolic system" (5, p 101); broader spacing ours-- Yu.K. and A.K.). The following assertion of L.O. Valt possesses a situational meaning: "The existence at a certain level of an isomorphous correspondence of two objects is an objective prerequisite so that one of them could serve as a model of the other; but this object will be a model only to the extent that it is included in the course of being perceived as a special "quasi-object" studied for the purpose of obtaining information from the other object" (6, p 41). A.N. Kochergin writes with coauthors in the same spirit (7, p 46): "We may consider everything as a model that we use as a model. Models as such do not exist, models become objects functioning in cognition as models." Such an interpretation may be summed up in a statement of V.Ye. Nikiforov (8, p 66): "The property of being a model is a functional rather than a structural or substrate feature."

Naturally, all the model conceptions are not purely "qualitative" or purely "situational," intermediate ones also exist. Thus, for example, I.B. Novik (9, p 42) and K.Ye. Morozov (10, p 40) define model as an object capable of replacing the original in the process of investigation of the latter.

Since the permissible degree of similarity or correspondence of model and original in their understanding can be quite different, their definitions encompass both theories and formal descriptions, inasmuch as the latter can serve as substitutes of the actual objects of investigation. For the purpose of differentiating model and theory, I.V. Novik employs an additional criterion: a model is an agent in regard to which scientific theory serves as an aim, as a kind of pretheory (9, p 68). In this way the given intermediary approach in its deep depth sides with the "broad" variant of the qualitative approach.

Thus in the case of the qualitative approach it is affirmed that a special class of objects called models exists. They continue to be models even outside the modeling situation. In the situational approach, it is asserted that models exist only in a modeling situation. A more significant contribution to scientific methodology has undoubtedly been made by V.A. Shtoff, I.B. Novik, K.Ye. Morozov and other representatives of the qualitative approach. In this connection, it is characteristic that the "broad" variant of the qualitative approach did not produce a constructive scientific product in the form of a developed generalized conception of modeling. This is quite natural inasmuch as this direction leads to including in the concept "model" all forms of scientific knowledge regardless of the presence or absence of a modeling situation. Nonetheless, developments of a more particular character within the framework of the aforesaid approach are quite possible. This is borne out by the detailed investigation by K.Ye. Morozov of mathematical and by I.B. Novikov of cybernetic modeling. V.A. Shtoff, a leading theoretician of the "narrow" variant of the qualitative approach, also developed a generalized conception of the model, but it seems to us that because of the initial position chosen by him, he only formed a conception of the role of material and ideal visual models in cognition.

Without getting deeper into a discussion why the situational conception of the model has not been further developed, we shall attempt to advance arguments in its favor. At the same time, we shall compare the conceptual possibilities of the situational and the "narrow" qualitative approach.

From the point of view of the situational approach, a model can be any object in a situation where it replaces another object.

In the case of the "narrow" qualitative approach, the existence of logico-mathematical models is denied in the empirical sciences. Where there are no models there can be no modeling. How does one handle in such a case "imitative mathematical models" which in the course of the last decade have become the most promising cognitive means in the sciences studying complex systems (11, p 293; 12, p 9). An "imitative model is a formalized description in electronic computers of the studied phenomenon in all its fullness on the border of our understanding" (13, p 6). Thus imitative models, from the point of view of V.A. Shtoff, come under the category of "nonmodels": they are formalized descriptions. But these "nonmodel" formations are utilized in sciences in conformity with the generally recognized structure of modeling. They are set up for a certain class of real systems (most frequently for one specific system), are investigated as substitutes of real systems, and the results of the investigation are carried over to real systems. The most characteristic feature of imitative modeling is the study of a model basically not by means of mathematical analysis but by means of a numerical reckoning of the course of values interesting the research (particularly on electronic computers) (11, p 294), of the "run" (14, p 23) or "playback" of the model (12, p 6).

A concrete example of imitative modeling may be found in the investigation of the global system "atmosphere--vegetation--soil" done by A.M. Tarko (15). He compiled, mathematically analyzed and subjected to numerical experiments a model of the circulation of carbon in this system. It was found that vegetation serves as a "buffer," absorbing a considerable portion of the carbon dioxide emitted by man into the atmosphere. During 1860-1970, it actually absorbed about 18-34 percent of the carbon dioxide produced by man.

A modeling situation arises in our view when the formalized description of any phenomenon (capable of possessing or not capable of possessing the status of theoretical knowledge) is investigated analytically and the purely mathematical results obtained are transferred to the investigated object. Thus in the analysis of a mathematico-genetic model of a population, it is possible to come to the conclusion that under certain conditions a sharply discrete replacement of populations and lack of resources for life) "life waves"--fluctuations in the size of populations--may occur not only as a consequence of the interaction of the given population with others or with conditions of the environment but also as a consequence of intraspecies biological mechanisms (16).

Thus if we do not wish to acknowledge the existence of modeling without a model, it would be advisable to reject the "narrow" qualitative approach to the concept "model." If we now return to the position of the "broad"

qualitative approach, we would deserve just criticism from V.A. Shtoff, who writes (3, p 13): "From a gnosiological point of view, the unsatisfactory nature of a position where there are linked to the term "model" meanings of a hypothetical theory, a quantitative theory (mathematical scheme, mathematical description) and a formal system (formalism) is that such word use does not evoke any new gnosiological problems that would be specific for the model and would not arise in connection with the analysis of the cognitive role of the theory in general, a hypothesis, logical and mathematical formalisms and other forms of reflection of reality."

In our view, a positive solution here can only be recognition of the situational nature of the concept "model." In this case we are not abusing the meaning of model and do not use it as a synonym for other methodological concepts. We use it for the singling out of a clearly fixed aspect of scientific-cognitive activity and a mediated study of the object of interest to us with the aid of its substitute--the method of modeling.

#### BIBLIOGRAPHY

1. Valt, L.O., "The Cognitive Significance of Model Representations in Physics."--UCHEN. ZAP. TARTUSK. UN-TA. Issue 153. Transactions on Philosophy VIII. Tartu, 1964, pp 1-136.
2. Moiseyev, N.N., "Systems Analysis of Dynamic Processes of the Biosphere. Systems Analysis and Mathematical Models."--VESTNIK AN SSSR, No 1, 1979, pp 97-108.
3. Shtoff, V.A. "Modelirovaniye i filosofiya" [Modeling and Philosophy]. Moscow-Leningrad, 1966.
4. Karakozova, Ye.V., "The Mental Model in the Structure of Social Cognition."--In the book: "Problemy metodologii nauki i nauchnogo tvorchestva" [Problems of Methodology of Science and Scientific Creativity]. Leningrad, 1977, pp 86-100.
5. Glinskiy, B.A., Gryaznov, B.S., Dynin, B.S. and Nikitin, Ye.P., "Modelirovaniye kak metod nauchnogo issledovaniya. (Gnoseologicheskiy analiz)" "Modeling as a Method of Scientific Research. (Gnosiological Analysis)]. Moscow, 196..
6. Valt, L.O., "The Problem of Model Adequacy in the Light of Lenin's Theory of Reflection."--UCHEN. ZAP. TARTUSK. UN-TA. Issue 269. Transactions on Philosophy XIV. Tartu, 1970, pp 36-47.
7. Kochergin, A.N., Fedorov, M.G. and Yarovikova, R.T., "Role of Classification in Refining the Concept of the Model."--NAUCH. TR. NOVOSIB. PED. IN-TA. Issue 84. Methodology and Logic of Scientific Cognition. Novosibirsk, 1973, pp 44-49.



8. Nikiforov, V.Ye., "Methods of Unification of the Term 'Model' and Development of a Generalized Definition of Modeling."--In the book: "Voprosy teorii poznaniya dialekticheskogo materialism" [Questions of the Theory of Cognition of Dialectical Materialism]. Issue 2. Riga, 1976, pp 60-79.
9. Novik, I.B., "O modelirovanii slozhnykh sistem" [On Modeling Complex Systems]. Moscow, 1965.
10. Morozov, K.Ye., "Matematicheskoye modelirovaniye v nauchnom poznanii" [Mathematical Modeling in Scientific Cognition]. Moscow, 1969.
11. Anokhin, Yu.A. and Ostromogil'skiy, A.Kh., "Certain Questions of Mathematical Modeling of Interaction of Man's Economic Activity and the Environment."--In the book: "Problemy optimizatsii v ekologii" [Problems of Optimization in Ecology]. Moscow, 1978, pp 291-308.
12. Adler, Yu.P. and Varygin, V.N., "Planning of Imitative Experiments."--In the book: Dzh. Kleynen, "Statisticheskiye metody v imitatsionnom modelirovanii" [Statistical Methods in Imitative Modeling]. Issue 1. Moscow, 1978, pp 5-11.
13. Moiseyev, N.N., "Foreword to the Russian Edition."--In the book: T. Neylor, "Mashinnyye imitatsionnyye eksperimenty s modelyami ekonomicheskikh sistem" [Machine Imitative Experiments with Models of Economic Systems]. Moscow, 1975, pp 5-8.
14. Shannon, R., "Imitatsionnoye modelirovaniye sistem--iskusstvo i nauka" [Imitative Modeling of Systems--Art and Science]. Moscow, 1978.
15. Tarko, A.M., "Mathematical Modeling of the Global Biochemical Carbon Cycle."--In the book: "Matematicheskiye modeli v ekologii i genetike" [Mathematical Models in Ecology and Genetics]. Moscow, 1981, pp 75-81.
16. Frisman, Ye.Ya., "Concerning an Evolutionary Mechanism of Emergence of Fluctuations in the Size of Population"--In the book: "Matematicheskoye modelirovaniye ekologicheskikh svoystv populyatsiy" [Mathematical Modeling of Ecological Characteristics of Populations]. Vladivostok, 1980, pp 21-25.

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## REGIONAL DEVELOPMENT

### INVESTMENT UNDERUTILIZED AT PAVLODAR-EKIBASTUZ TPK

Alma-Ata NARODNOYE KHOZYAYSTVO KAZAKHSTANA in Russian No 1, Jan 84 pp 46-49

[Article by Candidate of Economic Sciences V. Shelomentseva, docent, head of the Department of Economics, Organization and Planning of Production of Pavlodar Industrial Institute: "A Complex Regional Program Is Needed"]

[Text] The basis for the development of Pavlodar-Ekibastuz TPK is the Ekibastuz Coal Basin, unique in regard to industrial reserves and capacity, and the creation on this basis of a fuel and power complex. Furthermore, intensive development of metallurgy, petrochemistry and machine building is designated for this region. The effectiveness of public production at the TPK and its creation within the scheduled time periods will be determined in significant measure by the effectiveness of the investment process in which an important place is given to a construction complex, which is one of the basic elements of the production infrastructure.

The construction complex in this case should be understood as being the total combination of construction and construction-installation organizations of industrial enterprises for the production of construction materials, components and products; organizations providing construction with machines and mechanisms; enterprises engaged in the maintenance and modernization of construction equipment as well as scientific-research, planning and prospecting organizations, secondary technical and higher specialized educational institutions training engineering-technical and worker cadres for the sector. Today such a complex at the Pavlodar-Ekibastuz TPK includes 15 construction and installation trusts and about 60 primary contracting construction and installation organizations under the jurisdiction of trusts of other economic regions; construction subdivisions and sectors of enterprises and organizations conducting work on modernization and capital repair of buildings and structures by the economic method [khozyaystvennyy sposob]; 6 plants for the production of prefabricated reinforced concrete components and products and plants for the production of metal components and also woodworking combines; 7 planning-research and planning-design organizations; 28 vocational-technical schools and a construction and installation tekhnikum.

The rate of development of construction in the region may be judged by the dynamics of utilization of capital investment and construction-installation work (Figure 1).

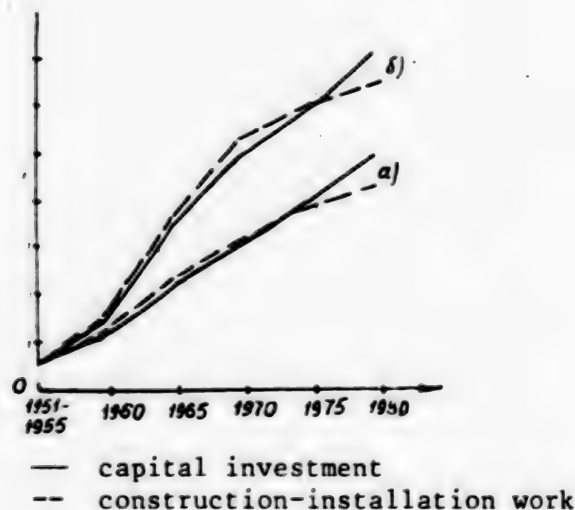


Figure 1. Dynamics of growth of capital investment and construction-installation work for Kazakh SSR (a) and Pavlodar Oblast (b) during 1951-1980.

The higher growth rates of capital investment and construction-installation work for the oblast during the years of the 8th, 9th, and 10th five-year plans compared to similar indicators for the republic are to be explained by the creation on its territory of the Pavlodar-Yermakov industrial hub and in the 10th Five-Year Plan--by the intensive forming of the Pavlodar-Ekibastuz TPK. The outlined tendency of a reduced growth rate of construction-installation work compared to capital investment testifies to progressive changes in the technological structure of the latter and is characterized by an increase in the relative share of production equipment and reduction of the share of construction-installation work as well as a change of the sectorial structure of capital investment.

The relative share of Pavlodar Oblast in the total volume of the republic's capital investment during the 10th Five-Year Plan grew from 5.07 to 7.36 percent. This attests to the growing rate of development of natural resources and intensive creation of a number of industrial sectors in the region. In the total volume of construction-installation work, more than half belongs to industrial construction, within the range of 17-18 percent--to housing, 10-11 percent--to transport construction, about 15 percent--to agricultural construction and slightly more than 3 percent--for miscellaneous.

The following figures provide an idea of the effectiveness of the operation of the construction complex.

During 1971-1981, labor productivity grew 1.28-fold and the capital-labor ratio of construction-installation work--2.23-fold. The output-capital ratio during

1. The statistical collection "Kapital'noye stroitel'stvo v Pavlodarskoy oblasti" [Capital Construction in Pavlodar Oblast], Pavlodar, 1982.

this period dropped 74.4 percent. It should be said that this indicator displays a stable tendency for reduction. During the period of intensive development of the construction complex, the outstripping growth of the capital-labor ratio relative to labor productivity became inevitable. At the same time, the level of the capital-labor ratio remained significantly lower than the capital-labor ratio of workers engaged in production. Up to the present time, the share of manual labor at construction projects continues to stand at about 60 percent.

Of course, these figures are not the only ones to attest to the operational effectiveness of the construction complex. The main indicator continues to ensure the startup of facilities and production capacities within scheduled periods. But here not everything is going well at the Pavlodar-Ekibastiz TPK. For a number of years, the startup rate of fixed capital and production capacities has lagged behind the rate of utilization of capital investment and gross fulfillment of construction-installation work. For TPK construction projects, above-norm stocks of uninstalled equipment amounted to 14,693,000 rubles as of 1 January 1982. And their growth in only one year was expressed in a sum exceeding 6 million rubles.

In the system of economic indicators, an important place belongs to the indicator of over-all cost characterizing the degree of concentration of capital investment. Such a cost determines the full volume of capital investment for construction projects carried out by the beginning of the calculated period and subject to fulfillment in the subsequent time prior to the full completion of the work. The ratio of the overall estimated cost of the facilities included in the annual plan exclusive of the cost of started up fixed capital to the annual volume of capital investment is determined by the linkage of the plan through the years. In the course of a period of more than 5 years of linkage of capital investment, the fate of subsequent five-year plans is largely determined.

For the purpose of ensuring a correspondence between the number of facilities included at one time in a plan and their estimated cost, prospects of annual financing of capital investment and norms of construction duration, Stroybank USSR recommends a procedure of norm setting for the size of the overall estimated cost.

According to data of the Pavlodar Oblast Office of Stroybank USSR, the total estimated cost of industrial construction projects of Pavlodar-Ekibastuz TPK amounted at the beginning of the last 3 years (1981, 1982, 1983) respectively to 1,129,860,000, 1,129,860,000 and 1,123,060,000 rubles. Estimated periods of construction or the indicator of capital-investment plan linkage were determined on the basis of information contained in title lists, plans for financing of capital investment and their fulfillment. In 1981, the actual average time of construction of TPK facilities was 7.4 years, exceeding the average estimated period specified in the title lists by 3.1 years and in capital-investment financing plans by 0.3 year. The startup of priority complexes of the Ekibastuz GRES-1 in 1982 was the result of reduction of the actual average time of completing the projects to 4.9 years. The limit of capital investment prescribed by the plan for financing construction projects of production designation of the Pavlodar-Ekibastuz TPK should ensure reduction of the average time by 0.3 year.



The realized measures in the field of capital construction relating to concentration of capital investment and curtailment of unfinished construction as yet do not ensure correspondence of plan and actual values for the average time of erecting facilities determined by title lists, the size of which has been set at 3.1 years (for 1983). Such a result in the operation of the TPK construction complex is due to irregular fulfillment of the capital-construction plan.

There are many reasons for this. Among them is inadequate working out of planning estimates, which have not taken into account necessary measures for the creation of the production and social infrastructures in Ekibastuz. The construction production base here is represented at the present time by a small plant for reinforced concrete products producing quite a broad product mix: items of light concrete, prestressed reinforced concrete components, basement wall units, metal components, commercial concrete and parts for large-panel building construction. In 1978 Glavpavlodarstroy turned over to Ekibastuzenergostroy Trust a base for the production of reinforced concrete products. This base was expanded, modernized, but at the present time the Ekibastuz Plant for Reinforced Concrete Products does not provide for the needs of the city. Because of this, deliveries of construction components and products are made by plants for reinforced-concrete products and metal components of Pavlodar, Yermak plants for reinforced-concrete parts and components, metal components and a combine of production enterprises as well as plants of other economic regions.

The forming of the Ekibastuz TPK within directive time periods is being significantly restrained because of existing disproportions in the development of the social infrastructure, which does not meet the requirements of the intensively growing city in regard to facilities of housing and cultural and personal service designation, health care, children's preschool institutions and the like.

The bureaucratic character of capital-investment planning has resulted in outlays for the creation of such facilities being significantly below the required. Erection of housing is being done in Ekibastuz by sectorial ministries and departments which are more concerned with startup of production capacities than with facilities of the nonproduction sphere. All this has a negative effect on the forming and operation of the complex through the labor factor in the form of lower labor productivity, increased turnover of the labor force and so on.

The next important reason for the unpunctual utilization of capital investment has been lack of integration in completion of work during the preparatory period during the erection of the Ekibastuz GRES-1 and also the fact that the creation of production capacities of construction-installation organizations took place during the period of launching of operations. It should be noted that in the formation of ETEK [not further identified], there was not provided as a rule simultaneity of construction of basic and auxiliary facilities of the complex.

In the process of construction of several of the facilities, corrections were made of planning estimates, which contributed to slowing down their startup and also required additional outlays of manpower, financial and material resources. Thus as a result of more precise specification of the plan of Ekibastus GRES-1 in 1982, with maintenance of former capacity, estimated cost grew 25 percent compared to the cost set by the 1980 title lists. And according to the Vostochnyy section, capital investment grew 121.7 percent with change in the plan, while the capacity increased only 50 percent.

The reasons for irregular assimilation of capital investment and extension of building time also included capacity shortages of the contracting construction organizations, untimely deliveries of production equipment; plan corrections; failing to hand in on time the required amount of planning estimates; changes in capital-investment five-year plans by sectorial ministries and departments; defects in the organization of and preparation for construction of facilities.

As shown by analysis, actual startup times of production capacities for practically all construction projects do not correspond to norms. The title lists of construction projects, which, in accordance with the decree of the CPSU Central Committee and the USSR Council of Ministers of June 12 July 1979 "On Improving Planning and Intensifying the Effect of the Economic Mechanism on Raising Effectiveness of Production and Quality of Work," ought to be unchanged for the entire period of construction. In reality, they are corrected on an annual basis with changes in the allocated amounts of capital investment and startup times of sections and production capacities. Revision of title lists is made because of yearly changes in plans and limits of capital investment allocated by the ministries (departments).

For an example, let us look at the data on allocation of capital investment for the construction of Ekibastuz GRES-1 in millions of rubles (see Table 1).

Thus even in planning itself conditions existed contributing to the disorganization of construction production and disruption of startup times of priority complexes. And these are no exceptions. A similar picture is to be observed in regard to other TPK construction projects.

The situation in regard to the development of the Pavlodar-Ekibastuz TPK has been examined repeatedly at different levels. Some improvements have been made. But so far there is no single program for determining the complex development of the TPK. There is no unified supervision. It, as before, is dispersed among different ministries and departments. And this has made itself felt quite painfully.

On the basis of the experience of working out regional program, it is possible to isolate four stages in their development. The first is scientific and preplanning development.

The second is planning-exploratory work and solution of architectural planning and also production-technological questions of an intersectorial and sectorial nature.

Table 1

| Years of construction | According to initial title list | According to more accurate title list | According to plan for capital-investment financing | Actually utilized capital investment |
|-----------------------|---------------------------------|---------------------------------------|--|--------------------------------------|
| 1                     | 2                               | 3                                     | 4  | 5                                    |
| 1974                  | 7.0/6.0                         | --                                    | 8.1/7.0  | 5.0/4.5                              |
| 1975                  | 18.0/15.0                       | --                                    | 14.2/12.1  | 6.6/5.25                             |
| 1976                  | 40.0/30.0                       | --                                    | 28.7/24.4  | 12.5/9.1                             |
| 1977                  | 75.0/45.0                       | 36.5/31.9                             | 36.5/31.9  | 24.1/19.3                            |
| 1978                  | 100.0/45.0                      | 80.0/50.0                             | 80.0/50.0  | 67.8/36.7                            |
| 1979                  | 60.0/30.0                       | 63.0/32.0                             | 100.4/52.0   | 100.5/52.1                           |
| 1980                  | 11.0/9.4                        | 90.0/35.0                             | 88.9/39.8  | 100.99/46.96                         |

Note: the numerator--amount of capital investment, denominator--volume of construction-installation work.

The third is implementation of the investment part of the program.

The fourth is utilization of production capacities and ensuring efficiency of operation of the created TPK in the process of solving the problem.

The regional complex program, by determining the solution of long-term questions over a period of 15-20 years, must serve as the basis for the development of medium-term plans of regional production complexes. In the TPK five-year plan, construction of facilities of all forms of production and social infrastructures, regardless of their department affiliation, must be coordinated in regard to time and resources.

A TPK investment construction program is created based on the targets of directive documents relating to startup of facilities, conditions of ensuring simultaneous startup of related facilities, existence and provision of manpower resources, development of a production base and provision of a social infrastructure for the facilities.

It takes into consideration capital-investment volume by years requirements for manpower and material-technical resources and social, cultural and personal-service facilities. Such a program, optimized in regard to time periods and resources, serves as an effective instrument in the practical work of planning organs.

For the Ekibastuz TPK, especially for the construction of installations of the power-engineering type, Orgenergostroy Institute of the USSR Ministry of Power and Electrification worked out a plan of flow-line organization of construction of thermal electric-power stations, a regional production and order filling base [proizvodstvenno-komplektovochaya baza], substations,

a power maintenance association, Gossnab and worker-supply department depots and expansion of Ekibastuz II railroad station and units of residential housing designation. But as a consequence of the fact that the regional production and order filling base was not built in the planned time, the flow pattern set up by the construction organization plan was also upset and the planned times for startup of priority complex for the GRES-1 and the GRES-2 were wrecked.

The single document for determining the construction organization of all the facilities of the complex and the resource requirements for their erection were not worked out on time. This circumstance and the lack of a single coordinator has foreordained insufficiently high effectiveness in the development of the Pavlodar-Ekibastuz Regional Production Complex. We believe that the time has arrived for the elimination of these lapses.

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